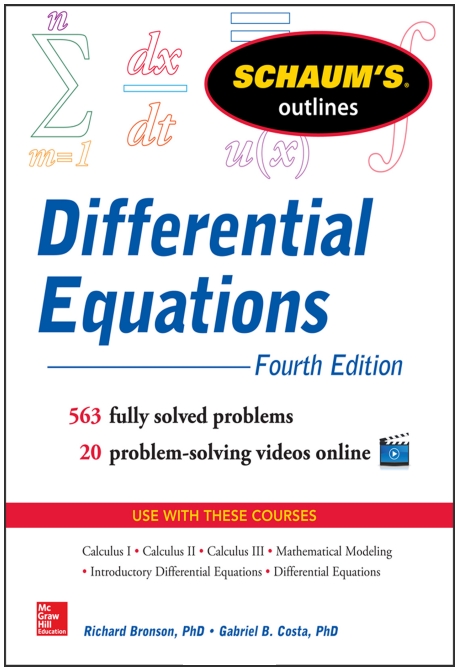
A Solution Manual For

Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014



Nasser M. Abbasi

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1 Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. page 95

1.1 problem Problem 11.1

Internal problem ID [5163]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. page 95
Problem number: Problem 11.1.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _with_linear_symmetries]]`

$$\boxed{y'' - y' - 2y = 4x^2}$$

✓ Solution by Maple

Time used: 0.016 (sec). Leaf size: 26

```
dsolve(diff(y(x),x$2)-diff(y(x),x)-2*y(x)=4*x^2,y(x), singsol=all)
```

$$y(x) = \mathrm{e}^{2x} c_2 + \mathrm{e}^{-x} c_1 - 2x^2 + 2x - 3$$

✓ Solution by Mathematica

Time used: 0.014 (sec). Leaf size: 31

```
DSolve[y''[x]-y'[x]-2*y[x]==4*x^2,y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to -2x^2 + 2x + c_1 e^{-x} + c_2 e^{2x} - 3$$

1.2 problem Problem 11.2

Internal problem ID [5164]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. page 95
Problem number: Problem 11.2.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _with_linear_symmetries]]`

$$\boxed{y'' - y' - 2y = \mathrm{e}^{3x}}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 23

```
dsolve(diff(y(x),x$2)-diff(y(x),x)-2*y(x)=exp(3*x),y(x), singsol=all)
```

$$y(x) = \mathrm{e}^{2x} c_2 + \mathrm{e}^{-x} c_1 + \frac{\mathrm{e}^{3x}}{4}$$

✓ Solution by Mathematica

Time used: 0.022 (sec). Leaf size: 31

```
DSolve[y''[x]-y'[x]-2*y[x]==Exp[3*x],y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{e^{3x}}{4} + c_1 e^{-x} + c_2 e^{2x}$$

1.3 problem Problem 11.3

Internal problem ID [5165]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. page 95
Problem number: Problem 11.3.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _linear, _nonhomogeneous]]`

$$\boxed{y'' - y' - 2y = \sin(2x)}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 29

```
dsolve(diff(y(x),x$2)-diff(y(x),x)-2*y(x)=sin(2*x),y(x), singsol=all)
```

$$y(x) = \mathrm{e}^{2x} c_2 + \mathrm{e}^{-x} c_1 + \frac{\cos(2x)}{20} - \frac{3\sin(2x)}{20}$$

✓ Solution by Mathematica

Time used: 0.116 (sec). Leaf size: 37

```
DSolve[y''[x]-y'[x]-2*y[x]==Sin[2*x],y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to c_1 e^{-x} + c_2 e^{2x} + \frac{1}{20}(\cos(2x) - 3\sin(2x))$$

1.4 problem Problem 11.4

Internal problem ID [5166]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. page 95
Problem number: Problem 11.4.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _linear, _nonhomogeneous]]`

$$\boxed{y'' - 6y' + 25y = 2\sin\left(\frac{t}{2}\right) - \cos\left(\frac{t}{2}\right)}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 37

```
dsolve(diff(y(t),t$2)-6*diff(y(t),t)+25*y(t)=2*sin(t/2)-cos(t/2),y(t), singsol=all)
```

$$y(t) = \mathrm{e}^{3t}\sin(4t)\,c_2 + \mathrm{e}^{3t}\cos(4t)\,c_1 + \frac{56\sin\left(\frac{t}{2}\right)}{663} - \frac{20\cos\left(\frac{t}{2}\right)}{663}$$

✓ Solution by Mathematica

Time used: 0.03 (sec). Leaf size: 51

```
DSolve[y''[t]-6*y'[t]+25*y[t]==2*Sin[t/2]-Cos[t/2],y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to \frac{1}{663}\left(56\sin\left(\frac{t}{2}\right) - 20\cos\left(\frac{t}{2}\right)\right) + c_2 e^{3t}\cos(4t) + c_1 e^{3t}\sin(4t)$$

1.5 problem Problem 11.5

Internal problem ID [5167]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. page 95
Problem number: Problem 11.5.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _with_linear_symmetries]]`

$$\boxed{y'' - 6y' + 25y = 64\,\mathrm{e}^{-t}}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 31

```
dsolve(diff(y(t),t$2)-6*diff(y(t),t)+25*y(t)=64*exp(-t),y(t), singsol=all)
```

$$y(t) = \mathrm{e}^{3t} \sin(4t)\, c_2 + \mathrm{e}^{3t} \cos(4t)\, c_1 + 2\,\mathrm{e}^{-t}$$

✓ Solution by Mathematica

Time used: 0.023 (sec). Leaf size: 37

```
DSolve[y''[t]-6*y'[t]+25*y[t]==64*Exp[-t],y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to e^{-t}\left(c_2 e^{4t} \cos(4t) + c_1 e^{4t} \sin(4t) + 2\right)$$

1.6 problem Problem 11.6

Internal problem ID [5168]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. page 95
Problem number: Problem 11.6.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _linear, _nonhomogeneous]]`

$$\boxed{y'' - 6y' + 25y = 50t^3 - 36t^2 - 63t + 18}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 33

```
dsolve(diff(y(t),t$2)-6*diff(y(t),t)+25*y(t)=50*t^3-36*t^2-63*t+18,y(t), singsol=all)
```

$$y(t) = \mathrm{e}^{3t} \sin(4t)\, c_2 + \mathrm{e}^{3t} \cos(4t)\, c_1 + 2t^3 - 3t$$

✓ Solution by Mathematica

Time used: 0.019 (sec). Leaf size: 38

```
DSolve[y''[t]-6*y'[t]+25*y[t]==50*t^3-36*t^2-63*t+18,y[t],t,IncludeSingularSolutions -> True
```

$$y(t) \to 2t^3 - 3t + c_2 e^{3t} \cos(4t) + c_1 e^{3t} \sin(4t)$$

1.7 problem Problem 11.7

Internal problem ID [5169]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. page 95
Problem number: Problem 11.7.
ODE order: 3.
ODE degree: 1.

CAS Maple gives this as type `[[_3rd_order, _linear, _nonhomogeneous]]`

$$\boxed{y''' - 6y'' + 11y' - 6y = 2x\,\mathrm{e}^{-x}}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 32

```
dsolve(diff(y(x),x$3)-6*diff(y(x),x$2)+11*diff(y(x),x)-6*y(x)=2*x*exp(-x),y(x), singsol=all)
```

$$y(x) = -\frac{(12x+13)\,\mathrm{e}^{-x}}{144} + \mathrm{e}^{x}c_1 + \mathrm{e}^{2x}c_2 + c_3\mathrm{e}^{3x}$$

✓ Solution by Mathematica

Time used: 0.007 (sec). Leaf size: 42

```
DSolve[y'''[x]-6*y''[x]+11*y'[x]-6*y[x]==2*x*Exp[-x],y[x],x,IncludeSingularSolutions -> True
```

$$y(x) \to -\frac{1}{144}e^{-x}(12x+13) + c_1e^{x} + c_2e^{2x} + c_3e^{3x}$$

1.8 problem Problem 11.8

Internal problem ID [5170]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. page 95
Problem number: Problem 11.8.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _quadrature]]`

$$\boxed{y'' = 9x^2 + 2x - 1}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 24

```
dsolve(diff(y(x),x$2)=9*x^2+2*x-1,y(x), singsol=all)
```

$$y(x) = \frac{3}{4}x^4 + \frac{1}{3}x^3 - \frac{1}{2}x^2 + c_1 x + c_2$$

✓ Solution by Mathematica

Time used: 0.002 (sec). Leaf size: 33

```
DSolve[y''[x]==9*x^2+2*x-1,y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{3x^4}{4} + \frac{x^3}{3} - \frac{x^2}{2} + c_2 x + c_1$$

1.9 problem Problem 11.10

Internal problem ID [5171]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. page 95
Problem number: Problem 11.10.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _with_linear_symmetries]]`

$$\boxed{y'' - 5y = 2\,\mathrm{e}^{5x}}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 28

```
dsolve(diff(y(x),x$2)-5*y(x)=2*exp(5*x),y(x), singsol=all)
```

$$y(x) = \mathrm{e}^{\sqrt{5}\,x} c_2 + \mathrm{e}^{-\sqrt{5}\,x} c_1 + \frac{\mathrm{e}^{5x}}{10}$$

✓ Solution by Mathematica

Time used: 0.021 (sec). Leaf size: 40

```
DSolve[y''[x]-5*y[x]==2*Exp[5*x],y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{e^{5x}}{10} + c_1 e^{\sqrt{5}x} + c_2 e^{-\sqrt{5}x}$$

1.10 problem Problem 11.12

Internal problem ID [5172]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. page 95
Problem number: Problem 11.12.
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[[_linear, 'class A']]`

$$\boxed{y' - 5y = (x-1)\sin(x) + (1+x)\cos(x)}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 29

```
dsolve(diff(y(x),x)-5*y(x)=(x-1)*sin(x)+(x+1)*cos(x),y(x), singsol=all)
```

$$y(x) = -\frac{3\cos(x)\,x}{13} - \frac{69\cos(x)}{338} - \frac{2\sin(x)\,x}{13} + \frac{71\sin(x)}{338} + c_1 \mathrm{e}^{5x}$$

✓ Solution by Mathematica

Time used: 0.229 (sec). Leaf size: 36

```
DSolve[y'[x]-5*y[x]==(x-1)*Sin[x]+(x+1)*Cos[x],y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{1}{338}((71-52x)\sin(x) - 3(26x+23)\cos(x)) + c_1 e^{5x}$$

1.11 problem Problem 11.13

Internal problem ID [5173]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. page 95
Problem number: Problem 11.13.
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[[_linear, 'class A']]`

$$\boxed{y' - 5y = 3\,\mathrm{e}^{x} - 2x + 1}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 19

```
dsolve(diff(y(x),x)-5*y(x)=3*exp(x)-2*x+1,y(x), singsol=all)
```

$$y(x) = \frac{2x}{5} - \frac{3}{25} - \frac{3\,\mathrm{e}^{x}}{4} + c_1 \mathrm{e}^{5x}$$

✓ Solution by Mathematica

Time used: 0.112 (sec). Leaf size: 29

```
DSolve[y'[x]-5*y[x]==3*Exp[x]-2*x+1,y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{2x}{5} - \frac{3e^{x}}{4} + c_1 e^{5x} - \frac{3}{25}$$

1.12 problem Problem 11.14

Internal problem ID [5174]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. page 95
Problem number: Problem 11.14.
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[[_linear, 'class A']]`

$$\boxed{y' - 5y = x^2 e^x - x\, e^{5x}}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 38

```
dsolve(diff(y(x),x)-5*y(x)=x^2*exp(x)-x*exp(5*x),y(x), singsol=all)
```

$$y(x) = \left(-\frac{x^2}{2} - \frac{x^2 e^{-4x}}{4} - \frac{e^{-4x} x}{8} - \frac{e^{-4x}}{32} + c_1\right) e^{5x}$$

✓ Solution by Mathematica

Time used: 0.209 (sec). Leaf size: 39

```
DSolve[y'[x]-5*y[x]==x^2*Exp[x]-x*Exp[5*x],y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to -\frac{1}{32} e^x \left(8x^2 + 4x + 1\right) + e^{5x}\left(-\frac{x^2}{2} + c_1\right)$$

2 Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. Supplementary Problems. page 101

2.1 problem Problem 11.44

Internal problem ID [5175]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. Supplementary Problems. page 101
Problem number: Problem 11.44.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _with_linear_symmetries]]`

$$\boxed{y'' - 2y' + y = x^2 - 1}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 21

```
dsolve(diff(y(x),x$2)-2*diff(y(x),x)+y(x)=x^2-1,y(x), singsol=all)
```

$$y(x) = \mathrm{e}^x c_2 + \mathrm{e}^x x c_1 + x^2 + 4x + 5$$

✓ Solution by Mathematica

Time used: 0.014 (sec). Leaf size: 26

```
DSolve[y''[x]-2*y'[x]+y[x]==x^2-1,y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to x^2 + x(4 + c_2 e^x) + c_1 e^x + 5$$

2.2 problem Problem 11.45

Internal problem ID [5176]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. Supplementary Problems. page 101
Problem number: Problem 11.45.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _with_linear_symmetries]]`

$$\boxed{y'' - 2y' + y = 4\,\mathrm{e}^{2x}}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 20

```
dsolve(diff(y(x),x$2)-2*diff(y(x),x)+y(x)=4*exp(2*x),y(x), singsol=all)
```

$$y(x) = \mathrm{e}^{x} c_2 + \mathrm{e}^{x} x c_1 + 4\,\mathrm{e}^{2x}$$

✓ Solution by Mathematica

Time used: 0.016 (sec). Leaf size: 21

```
DSolve[y''[x]-2*y'[x]+y[x]==4*Exp[2*x],y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to e^{x}(4e^{x} + c_2 x + c_1)$$

2.3 problem Problem 11.46

Internal problem ID [5177]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. Supplementary Problems. page 101
Problem number: Problem 11.46.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _linear, _nonhomogeneous]]`

$$\boxed{y'' - 2y' + y = 4\cos(x)}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 18

```
dsolve(diff(y(x),x$2)-2*diff(y(x),x)+y(x)=4*cos(x),y(x), singsol=all)
```

$$y(x) = \mathrm{e}^{x} c_2 + \mathrm{e}^{x} x c_1 - 2\sin(x)$$

✓ Solution by Mathematica

Time used: 0.018 (sec). Leaf size: 21

```
DSolve[y''[x]-2*y'[x]+y[x]==4*Cos[x],y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to -2\sin(x) + e^{x}(c_2 x + c_1)$$

2.4 problem Problem 11.47

Internal problem ID [5178]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. Supplementary Problems. page 101
Problem number: Problem 11.47.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _with_linear_symmetries]]`

$$\boxed{y'' - 2y' + y = 3\,\mathrm{e}^{x}}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 21

```
dsolve(diff(y(x),x$2)-2*diff(y(x),x)+y(x)=3*exp(x),y(x), singsol=all)
```

$$y(x) = \mathrm{e}^{x} c_2 + \mathrm{e}^{x} x c_1 + \frac{3\,\mathrm{e}^{x} x^2}{2}$$

✓ Solution by Mathematica

Time used: 0.019 (sec). Leaf size: 27

```
DSolve[y''[x]-2*y'[x]+y[x]==3*Exp[x],y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{1}{2} e^{x} \left(3x^2 + 2c_2 x + 2c_1\right)$$

2.5 problem Problem 11.48

Internal problem ID [5179]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. Supplementary Problems. page 101
Problem number: Problem 11.48.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _linear, _nonhomogeneous]]`

$$\boxed{y'' - 2y' + y = x\,\mathrm{e}^{x}}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 21

```
dsolve(diff(y(x),x$2)-2*diff(y(x),x)+y(x)=x*exp(x),y(x), singsol=all)
```

$$y(x) = \mathrm{e}^{x} c_2 + \mathrm{e}^{x} x c_1 + \frac{\mathrm{e}^{x} x^3}{6}$$

✓ Solution by Mathematica

Time used: 0.019 (sec). Leaf size: 25

```
DSolve[y''[x]-2*y'[x]+y[x]==x*Exp[x],y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{1}{6} e^{x} \left(x^3 + 6c_2 x + 6c_1\right)$$

2.6 problem Problem 11.49

Internal problem ID [5180]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. Supplementary Problems. page 101
Problem number: Problem 11.49.
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[[_linear, 'class A']]`

$$\boxed{y' - y = \mathrm{e}^{x}}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 10

```
dsolve(diff(y(x),x)-y(x)=exp(x),y(x), singsol=all)
```

$$y(x) = (x + c_1)\,\mathrm{e}^{x}$$

✓ Solution by Mathematica

Time used: 0.037 (sec). Leaf size: 13

```
DSolve[y'[x]-y[x]==Exp[x],y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to e^{x}(x + c_1)$$

2.7 problem Problem 11.50

Internal problem ID [5181]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. Supplementary Problems. page 101
Problem number: Problem 11.50.
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[[_linear, 'class A']]`

$$\boxed{y' - y = \mathrm{e}^{2x} x + 1}$$

✓ Solution by Maple

Time used: 0.016 (sec). Leaf size: 22

```
dsolve(diff(y(x),x)-y(x)=x*exp(2*x)+1,y(x), singsol=all)
```

$$y(x) = \mathrm{e}^{2x} x - \mathrm{e}^{2x} - 1 + \mathrm{e}^{x} c_1$$

✓ Solution by Mathematica

Time used: 0.056 (sec). Leaf size: 22

```
DSolve[y'[x]-y[x]==x*Exp[2*x]+1,y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to e^{2x}(x-1) + c_1 e^{x} - 1$$

2.8 problem Problem 11.51

Internal problem ID [5182]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. Supplementary Problems. page 101
Problem number: Problem 11.51.
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[[_linear, 'class A']]`

$$\boxed{y' - y = \sin(x) + \cos(2x)}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 29

```
dsolve(diff(y(x),x)-y(x)=sin(x)+cos(2*x),y(x), singsol=all)
```

$$y(x) = \mathrm{e}^{x} c_1 - \frac{\cos(x)}{2} - \frac{\sin(x)}{2} + \frac{2\sin(2x)}{5} - \frac{\cos(2x)}{5}$$

✓ Solution by Mathematica

Time used: 0.16 (sec). Leaf size: 37

```
DSolve[y'[x]-y[x]==Sin[x]+Cos[2*x],y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{1}{10}(-5\sin(x) + 4\sin(2x) - 5\cos(x) - 2\cos(2x) + 10c_1 e^{x})$$

2.9 problem Problem 11.52

Internal problem ID [5183]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 11. THE METHOD OF UNDETERMINED COEFFICIENTS. Supplementary Problems. page 101
Problem number: Problem 11.52.
ODE order: 3.
ODE degree: 1.

CAS Maple gives this as type `[[_3rd_order, _with_linear_symmetries]]`

$$\boxed{y''' - 3y'' + 3y' - y = \mathrm{e}^x + 1}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 29

```
dsolve(diff(y(x),x$3)-3*diff(y(x),x$2)+3*diff(y(x),x)-y(x)=exp(x)+1,y(x), singsol=all)
```

$$y(x) = \frac{\mathrm{e}^x x^3}{6} - 1 + \mathrm{e}^x c_1 + c_2 \mathrm{e}^x x + c_3 \mathrm{e}^x x^2$$

✓ Solution by Mathematica

Time used: 0.067 (sec). Leaf size: 31

```
DSolve[y'''[x]-3*y''[x]+3*y'[x]-y[x]==Exp[x]+1,y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to -1 + e^x \left(\frac{x^3}{6} + c_3 x^2 + c_2 x + c_1 \right)$$

3 Chapter 12. VARIATION OF PARAMETERS. page 104

3.1 problem Problem 12.1

Internal problem ID [5184]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 12. VARIATION OF PARAMETERS. page 104
Problem number: Problem 12.1.
ODE order: 3.
ODE degree: 1.

CAS Maple gives this as type `[[_3rd_order, _missing_y]]`

$$\boxed{y''' + y' = \sec(x)}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 98

```
dsolve(diff(y(x),x$3)+diff(y(x),x)=sec(x),y(x), singsol=all)
```

$$\begin{aligned} y(x) &= \sin(x) - \cos(x)\, x + \sin(x)\, c_1 - \cos(x)\, c_2 \\ &\quad + \frac{i\left(2i\ln(2)\sin(x) + e^{ix}\ln\left(\frac{e^{ix}}{e^{2ix}+1}\right) + e^{ix} - 4\arctan\left(e^{ix}\right) - e^{-ix}\ln\left(\frac{e^{ix}}{e^{2ix}+1}\right) - e^{-ix}\right)}{2} \\ &\quad + c_3 \end{aligned}$$

✓ Solution by Mathematica

Time used: 0.061 (sec). Leaf size: 57

```
DSolve[y'''[x]+y'[x]==Sec[x],y[x],x,IncludeSingularSolutions -> True]
```

$$\begin{aligned} y(x) \to &-(x + c_2)\cos(x) - \log\left(\cos\left(\frac{x}{2}\right) - \sin\left(\frac{x}{2}\right)\right) \\ &+ \log\left(\sin\left(\frac{x}{2}\right) + \cos\left(\frac{x}{2}\right)\right) + \sin(x)(\log(\cos(x)) + c_1) + c_3 \end{aligned}$$

3.2 problem Problem 12.2

Internal problem ID [5185]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 12. VARIATION OF PARAMETERS. page 104
Problem number: Problem 12.2.
ODE order: 3.
ODE degree: 1.

CAS Maple gives this as type `[[_3rd_order, _missing_y]]`

$$\boxed{y''' - 3y'' + 2y' = \frac{\mathrm{e}^{x}}{1+\mathrm{e}^{-x}}}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 65

```
dsolve(diff(y(x),x$3)-3*diff(y(x),x$2)+2*diff(y(x),x)=exp(x)/(1+exp(-x)),y(x), singsol=all)
```

$$y(x) = \mathrm{e}^{x} c_2 + \mathrm{e}^{x} \ln\left(\mathrm{e}^{-x}\right) + \frac{\mathrm{e}^{x}}{2} + \frac{\mathrm{e}^{2x} c_1}{2} - \frac{x}{2} - \frac{\ln\left(1+\mathrm{e}^{-x}\right)}{2} - \frac{\mathrm{e}^{2x}\ln\left(1+\mathrm{e}^{-x}\right)}{2} - \ln\left(1+\mathrm{e}^{-x}\right)\mathrm{e}^{x} + c_3$$

✓ Solution by Mathematica

Time used: 0.137 (sec). Leaf size: 59

```
DSolve[y'''[x]-3*y''[x]+2*y'[x]==Exp[x]/(1+Exp[-x]),y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{1}{2}\left(-2e^{2x}\operatorname{arctanh}(2e^{x}+1) - (2e^{x}+1)\log\left(e^{x}+1\right) + e^{x}(c_2 e^{x} + 1 + 2c_1)\right) + c_3$$

3.3 problem Problem 12.3

Internal problem ID [5186]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 12. VARIATION OF PARAMETERS. page 104
Problem number: Problem 12.3.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _linear, _nonhomogeneous]]`

$$\boxed{y'' - 2y' + y = \frac{\mathrm{e}^x}{x}}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 22

```
dsolve(diff(y(x),x$2)-2*diff(y(x),x)+y(x)=exp(x)/x,y(x), singsol=all)
```

$$y(x) = \mathrm{e}^x c_2 + \mathrm{e}^x x c_1 + \mathrm{e}^x x(-1 + \ln(x))$$

✓ Solution by Mathematica

Time used: 0.02 (sec). Leaf size: 22

```
DSolve[y''[x]-2*y'[x]+y[x]==Exp[x]/x,y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to e^x(x \log(x) + (-1 + c_2)x + c_1)$$

3.4 problem Problem 12.4

Internal problem ID [5187]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 12. VARIATION OF PARAMETERS. page 104
Problem number: Problem 12.4.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _with_linear_symmetries]]`

$$\boxed{y'' - y' - 2y = \mathrm{e}^{3x}}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 23

```
dsolve(diff(y(x),x$2)-diff(y(x),x)-2*y(x)=exp(3*x),y(x), singsol=all)
```

$$y(x) = \mathrm{e}^{2x} c_2 + \mathrm{e}^{-x} c_1 + \frac{\mathrm{e}^{3x}}{4}$$

✓ Solution by Mathematica

Time used: 0.02 (sec). Leaf size: 31

```
DSolve[y''[x]-y'[x]-2*y[x]==Exp[3*x],y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{e^{3x}}{4} + c_1 e^{-x} + c_2 e^{2x}$$

3.5 problem Problem 12.5

Internal problem ID [5188]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 12. VARIATION OF PARAMETERS. page 104
Problem number: Problem 12.5.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _linear, _nonhomogeneous]]`

$$\boxed{x'' + 4x = \sin(2t)^2}$$

✓ Solution by Maple

Time used: 0.016 (sec). Leaf size: 24

```
dsolve(diff(x(t),t$2)+4*x(t)=sin(2*t)^2,x(t), singsol=all)
```

$$x(t) = \sin(2t)\, c_2 + \cos(2t)\, c_1 + \frac{1}{8} + \frac{\cos(4t)}{24}$$

✓ Solution by Mathematica

Time used: 0.09 (sec). Leaf size: 31

```
DSolve[x''[t]+4*x[t]==Sin[2*t]^2,x[t],t,IncludeSingularSolutions -> True]
```

$$x(t) \to \frac{1}{24}\cos(4t) + c_1 \cos(2t) + c_2 \sin(2t) + \frac{1}{8}$$

3.6 problem Problem 12.6

Internal problem ID [5189]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 12. VARIATION OF PARAMETERS. page 104
Problem number: Problem 12.6.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _with_linear_symmetries]]`

$$\boxed{t^2 N'' - 2tN' + 2N = t \ln(t)}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 26

```
dsolve(t^2*diff(N(t),t$2)-2*t*diff(N(t),t)+2*N(t)=t*ln(t),N(t), singsol=all)
```

$$N(t) = t^2 c_2 + t c_1 - \frac{t\left(\ln(t)^2 + 2\ln(t) + 2\right)}{2}$$

✓ Solution by Mathematica

Time used: 0.019 (sec). Leaf size: 30

```
DSolve[t^2*n''[t]-2*t*n'[t]+2*n[t]==t*Log[t],n[t],t,IncludeSingularSolutions -> True]
```

$$n(t) \to -\frac{1}{2} t \log^2(t) - t \log(t) + t(c_2 t - 1 + c_1)$$

3.7 problem Problem 12.7

Internal problem ID [5190]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 12. VARIATION OF PARAMETERS. page 104
Problem number: Problem 12.7.
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_linear]`

$$\boxed{y' + \frac{4y}{x} = x^4}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 15

```
dsolve(diff(y(x),x)+(4/x)*y(x)=x^4,y(x), singsol=all)
```

$$y(x) = \frac{\frac{x^9}{9} + c_1}{x^4}$$

✓ Solution by Mathematica

Time used: 0.027 (sec). Leaf size: 19

```
DSolve[y'[x]+(4/x)*y[x]==x^4,y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{x^5}{9} + \frac{c_1}{x^4}$$

3.8 problem Problem 12.8

Internal problem ID [5191]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 12. VARIATION OF PARAMETERS. page 104
Problem number: Problem 12.8.
ODE order: 4.
ODE degree: 1.

CAS Maple gives this as type `[[_high_order, _quadrature]]`

$$\boxed{y'''' = 5x}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 32

```
dsolve(diff(y(x),x$4)=5*x,y(x), singsol=all)
```

$$y(x) = \frac{1}{24}x^5 + \frac{1}{6}c_1x^3 + \frac{3}{10}c_1^2x + \frac{1}{2}c_2x^2 + c_3x + c_4$$

✓ Solution by Mathematica

Time used: 0.003 (sec). Leaf size: 31

```
DSolve[y''''[x]==5*x,y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{x^5}{24} + c_4x^3 + c_3x^2 + c_2x + c_1$$

4 Chapter 12. VARIATION OF PARAMETERS. Supplementary Problems. page 109

4.1 problem Problem 12.9

Internal problem ID [5192]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 12. VARIATION OF PARAMETERS. Supplementary Problems. page 109
Problem number: Problem 12.9.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _linear, _nonhomogeneous]]`

$$\boxed{y'' - 2y' + y = \frac{\mathrm{e}^x}{x^5}}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 21

```
dsolve(diff(y(x),x$2)-2*diff(y(x),x)+y(x)=exp(x)/x^5,y(x), singsol=all)
```

$$y(x) = \mathrm{e}^x c_2 + \mathrm{e}^x x c_1 + \frac{\mathrm{e}^x}{12x^3}$$

✓ Solution by Mathematica

Time used: 0.023 (sec). Leaf size: 25

```
DSolve[y''[x]-2*y'[x]+y[x]==Exp[x]/x^5,y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{1}{12} e^x \left(\frac{1}{x^3} + 12 c_2 x + 12 c_1 \right)$$

4.2 problem Problem 12.10

Internal problem ID [5193]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 12. VARIATION OF PARAMETERS. Supplementary Problems. page 109
Problem number: Problem 12.10.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _linear, _nonhomogeneous]]`

$$\boxed{y'' + y = \sec(x)}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 24

```
dsolve(diff(y(x),x$2)+y(x)=sec(x),y(x), singsol=all)
```

$$y(x) = \sin(x)\, c_2 + c_1 \cos(x) + \sin(x)\, x - \ln(\sec(x)) \cos(x)$$

✓ Solution by Mathematica

Time used: 0.021 (sec). Leaf size: 22

```
DSolve[y''[x]+y[x]==Sec[x],y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to (x + c_2)\sin(x) + \cos(x)(\log(\cos(x)) + c_1)$$

4.3 problem Problem 12.11

Internal problem ID [5194]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 12. VARIATION OF PARAMETERS. Supplementary Problems. page 109
Problem number: Problem 12.11.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _with_linear_symmetries]]`

$$\boxed{y'' - y' - 2y = \mathrm{e}^{3x}}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 23

```
dsolve(diff(y(x),x$2)-diff(y(x),x)-2*y(x)=exp(3*x),y(x), singsol=all)
```

$$y(x) = \mathrm{e}^{2x} c_2 + \mathrm{e}^{-x} c_1 + \frac{\mathrm{e}^{3x}}{4}$$

✓ Solution by Mathematica

Time used: 0.021 (sec). Leaf size: 31

```
DSolve[y''[x]-y'[x]-2*y[x]==Exp[3*x],y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{e^{3x}}{4} + c_1 e^{-x} + c_2 e^{2x}$$

4.4 problem Problem 12.12

Internal problem ID [5195]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 12. VARIATION OF PARAMETERS. Supplementary Problems. page 109
Problem number: Problem 12.12.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _with_linear_symmetries]]`

$$\boxed{y'' - 60y' - 900y = 5\,\mathrm{e}^{10x}}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 33

```
dsolve(diff(y(x),x$2)-60*diff(y(x),x)-900*y(x)=5*exp(10*x),y(x), singsol=all)
```

$$y(x) = \mathrm{e}^{30\left(1+\sqrt{2}\right)x} c_2 + \mathrm{e}^{-30\left(\sqrt{2}-1\right)x} c_1 - \frac{\mathrm{e}^{10x}}{280}$$

✓ Solution by Mathematica

Time used: 0.027 (sec). Leaf size: 45

```
DSolve[y''[x]-60*y'[x]-900*y[x]==5*Exp[10*x],y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to -\frac{e^{10x}}{280} + c_1 e^{-30\left(\sqrt{2}-1\right)x} + c_2 e^{30\left(1+\sqrt{2}\right)x}$$

4.5 problem Problem 12.13

Internal problem ID [5196]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 12. VARIATION OF PARAMETERS. Supplementary Problems. page 109
Problem number: Problem 12.13.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _missing_x]]`

$$\boxed{y'' - 7y' = -3}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 16

```
dsolve(diff(y(x),x$2)-7*diff(y(x),x)=-3,y(x), singsol=all)
```

$$y(x) = \frac{\mathrm{e}^{7x} c_1}{7} + \frac{3x}{7} + c_2$$

✓ Solution by Mathematica

Time used: 0.022 (sec). Leaf size: 24

```
DSolve[y''[x]-7*y'[x]==-3,y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{3x}{7} + \frac{1}{7} c_1 e^{7x} + c_2$$

4.6 problem Problem 12.14

Internal problem ID [5197]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 12. VARIATION OF PARAMETERS. Supplementary Problems. page 109
Problem number: Problem 12.14.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _exact, _linear, _nonhomogeneous]]`

$$\boxed{y'' + \frac{y'}{x} - \frac{y}{x^2} = \ln(x)}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 24

```
dsolve(diff(y(x),x$2)+1/x*diff(y(x),x)-1/x^2*y(x)=ln(x),y(x), singsol=all)
```

$$y(x) = c_1 x + \frac{c_2}{x} + \frac{x^2(3\ln(x) - 4)}{9}$$

✓ Solution by Mathematica

Time used: 0.016 (sec). Leaf size: 32

```
DSolve[y''[x]+1/x*y'[x]-1/x^2*y[x]==Log[x],y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to -\frac{4x^2}{9} + \frac{1}{3}x^2 \log(x) + c_2 x + \frac{c_1}{x}$$

4.7 problem Problem 12.15

Internal problem ID [5198]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 12. VARIATION OF PARAMETERS. Supplementary Problems. page 109
Problem number: Problem 12.15.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _missing_y]]`

$$\boxed{x^2y'' - y'x = x^3\mathrm{e}^x}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 20

```
dsolve(x^2*diff(y(x),x$2)-x*diff(y(x),x)=x^3*exp(x),y(x), singsol=all)
```

$$y(x) = \frac{c_1x^2}{2} + \mathrm{e}^x x - \mathrm{e}^x + c_2$$

✓ Solution by Mathematica

Time used: 0.086 (sec). Leaf size: 24

```
DSolve[x^2*y''[x]-x*y'[x]==x^3*Exp[x],y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{c_1x^2}{2} + e^x(x-1) + c_2$$

4.8 problem Problem 12.16

Internal problem ID [5199]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 12. VARIATION OF PARAMETERS. Supplementary Problems. page 109
Problem number: Problem 12.16.
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_linear]`

$$\boxed{y' - \frac{y}{x} = x^2}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 13

```
dsolve(diff(y(x),x)-1/x*y(x)=x^2,y(x), singsol=all)
```

$$y(x) = \left(\frac{x^2}{2} + c_1\right) x$$

✓ Solution by Mathematica

Time used: 0.025 (sec). Leaf size: 17

```
DSolve[y'[x]-1/x*y[x]==x^2,y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{x^3}{2} + c_1 x$$

5 Chapter 24. Solutions of linear DE by Laplace transforms. Supplementary Problems. page 248

5.1 problem Problem 24.17

Internal problem ID [5200]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 24. Solutions of linear DE by Laplace transforms. Supplementary Problems. page 248
Problem number: Problem 24.17.
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

$$\boxed{y' + 2y = 0}$$

With initial conditions

$$[y(0) = 1]$$

✓ Solution by Maple

Time used: 0.016 (sec). Leaf size: 8

```
dsolve([diff(y(x),x)+2*y(x)=0,y(0) = 1],y(x), singsol=all)
```

$$y(x) = \mathrm{e}^{-2x}$$

✓ Solution by Mathematica

Time used: 0.023 (sec). Leaf size: 10

```
DSolve[{y'[x]+2*y[x]==0,{y[0]==1}},y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to e^{-2x}$$

5.2 problem Problem 24.18

Internal problem ID [5201]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 24. Solutions of linear DE by Laplace transforms. Supplementary Problems. page 248
Problem number: Problem 24.18.
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

$$\boxed{y' + 2y = 2}$$

With initial conditions

$$[y(0) = 1]$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 5

```
dsolve([diff(y(x),x)+2*y(x)=2,y(0) = 1],y(x), singsol=all)
```

$$y(x) = 1$$

✓ Solution by Mathematica

Time used: 0.001 (sec). Leaf size: 6

```
DSolve[{y'[x]+2*y[x]==2,{y[0]==1}},y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to 1$$

5.3 problem Problem 24.19

Internal problem ID [5202]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 24. Solutions of linear DE by Laplace transforms. Supplementary Problems. page 248
Problem number: Problem 24.19.
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[[_linear, 'class A']]`

$$\boxed{y' + 2y = \mathrm{e}^{x}}$$

With initial conditions

$$[y(0) = 1]$$

✓ Solution by Maple

Time used: 0.016 (sec). Leaf size: 16

```
dsolve([diff(y(x),x)+2*y(x)=exp(x),y(0) = 1],y(x), singsol=all)
```

$$y(x) = \frac{(\mathrm{e}^{3x} + 2)\,\mathrm{e}^{-2x}}{3}$$

✓ Solution by Mathematica

Time used: 0.04 (sec). Leaf size: 21

```
DSolve[{y'[x]+2*y[x]==Exp[x],{y[0]==1}},y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{1}{3}e^{-2x}\left(e^{3x} + 2\right)$$

5.4 problem Problem 24.26

Internal problem ID [5203]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 24. Solutions of linear DE by Laplace transforms. Supplementary Problems. page 248
Problem number: Problem 24.26.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _missing_x]]`

$$\boxed{y'' - y = 0}$$

With initial conditions

$$[y(0) = 1, y'(0) = 1]$$

✓ Solution by Maple

Time used: 0.016 (sec). Leaf size: 6

```
dsolve([diff(y(x),x$2)-y(x)=0,y(0) = 1, D(y)(0) = 1],y(x), singsol=all)
```

$$y(x) = \mathrm{e}^{x}$$

✓ Solution by Mathematica

Time used: 0.046 (sec). Leaf size: 26

```
DSolve[{y''[x]-y[x]==Sin[x],{y[0]==1,y'[0]==1}},y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{1}{4}\left(-e^{-x} + 5e^{x} - 2\sin(x)\right)$$

5.5 problem Problem 24.27

Internal problem ID [5204]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 24. Solutions of linear DE by Laplace transforms. Supplementary Problems. page 248
Problem number: Problem 24.27.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _linear, _nonhomogeneous]]`

$$\boxed{y'' - y = \sin(x)}$$

With initial conditions

$$[y(0) = 0, y'(0) = 1]$$

✓ Solution by Maple

Time used: 0.016 (sec). Leaf size: 19

```
dsolve([diff(y(x),x$2)-y(x)=sin(x),y(0) = 0, D(y)(0) = 1],y(x), singsol=all)
```

$$y(x) = -\frac{3\,\mathrm{e}^{-x}}{4} + \frac{3\,\mathrm{e}^{x}}{4} - \frac{\sin(x)}{2}$$

✓ Solution by Mathematica

Time used: 0.034 (sec). Leaf size: 26

```
DSolve[{y''[x]-y[x]==Sin[x],{y[0]==1,y'[0]==1}},y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{1}{4}\left(-e^{-x} + 5e^{x} - 2\sin(x)\right)$$

5.6 problem Problem 24.28

Internal problem ID [5205]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 24. Solutions of linear DE by Laplace transforms. Supplementary Problems. page 248
Problem number: Problem 24.28.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _with_linear_symmetries]]`

$$\boxed{y'' - y = \mathrm{e}^{x}}$$

With initial conditions

$$[y(0) = 1, y'(0) = 0]$$

✓ Solution by Maple

Time used: 0.031 (sec). Leaf size: 20

```
dsolve([diff(y(x),x$2)-y(x)=exp(x),y(0) = 1, D(y)(0) = 0],y(x), singsol=all)
```

$$y(x) = \frac{3\,\mathrm{e}^{-x}}{4} + \frac{(2x+1)\,\mathrm{e}^{x}}{4}$$

✓ Solution by Mathematica

Time used: 0.017 (sec). Leaf size: 27

```
DSolve[{y''[x]-y[x]==Exp[x],{y[0]==1,y'[0]==0}},y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{1}{4}e^{-x}\left(e^{2x}(2x+1)+3\right)$$

5.7 problem Problem 24.29

Internal problem ID [5206]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 24. Solutions of linear DE by Laplace transforms. Supplementary Problems. page 248
Problem number: Problem 24.29.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _linear, _nonhomogeneous]]`

$$\boxed{y'' + 2y' - 3y = \sin(2x)}$$

With initial conditions

$$[y(0) = 0, y'(0) = 0]$$

✓ Solution by Maple

Time used: 0.032 (sec). Leaf size: 27

```
dsolve([diff(y(x),x$2)+2*diff(y(x),x)-3*y(x)=sin(2*x),y(0) = 0, D(y)(0) = 0],y(x), singsol=a
```

$$y(x) = -\frac{4\,\mathrm{e}^{-3x}\left(\left(\cos(2x) + \frac{7\sin(2x)}{4}\right)\mathrm{e}^{3x} - \frac{13\,\mathrm{e}^{4x}}{8} + \frac{5}{8}\right)}{65}$$

✓ Solution by Mathematica

Time used: 0.109 (sec). Leaf size: 36

```
DSolve[{y''[x]-2*y'[x]-3*y[x]==Sin[2*x],{y[0]==0,y'[0]==0}},y[x],x,IncludeSingularSolutions
```

$$y(x) \to \frac{1}{130}\left(-13e^{-x} + 5e^{3x} - 14\sin(2x) + 8\cos(2x)\right)$$

5.8 problem Problem 24.30

Internal problem ID [5207]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 24. Solutions of linear DE by Laplace transforms. Supplementary Problems. page 248
Problem number: Problem 24.30.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _linear, _nonhomogeneous]]`

$$\boxed{y'' + y = \sin(x)}$$

With initial conditions

$$[y(0) = 0, y'(0) = 2]$$

✓ Solution by Maple

Time used: 0.015 (sec). Leaf size: 14

```
dsolve([diff(y(x),x$2)+y(x)=sin(x),y(0) = 0, D(y)(0) = 2],y(x), singsol=all)
```

$$y(x) = \frac{5\sin(x)}{2} - \frac{\cos(x)\,x}{2}$$

✓ Solution by Mathematica

Time used: 0.027 (sec). Leaf size: 19

```
DSolve[{y''[x]+y[x]==Sin[x],{y[0]==0,y'[0]==2}},y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to \frac{1}{2}(5\sin(x) - x\cos(x))$$

5.9 problem Problem 24.31

Internal problem ID [5208]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 24. Solutions of linear DE by Laplace transforms. Supplementary Problems. page 248
Problem number: Problem 24.31.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _missing_x]]`

$$\boxed{y'' + y' + y = 0}$$

With initial conditions

$$[y(0) = 4, y'(0) = -3]$$

✓ Solution by Maple

Time used: 0.047 (sec). Leaf size: 31

```
dsolve([diff(y(x),x$2)+diff(y(x),x)+y(x)=0,y(0) = 4, D(y)(0) = -3],y(x), singsol=all)
```

$$y(x) = -\frac{2\,\mathrm{e}^{-\frac{x}{2}}\left(\sqrt{3}\,\sin\left(\frac{\sqrt{3}\,x}{2}\right) - 6\cos\left(\frac{\sqrt{3}\,x}{2}\right)\right)}{3}$$

✓ Solution by Mathematica

Time used: 0.023 (sec). Leaf size: 47

```
DSolve[{y''[x]+y'[x]+y[x]==0,{y[0]==4,y'[0]==-3}},y[x],x,IncludeSingularSolutions -> True]
```

$$y(x) \to -\frac{2}{3}e^{-x/2}\left(\sqrt{3}\sin\left(\frac{\sqrt{3}x}{2}\right) - 6\cos\left(\frac{\sqrt{3}x}{2}\right)\right)$$

5.10 problem Problem 24.32

Internal problem ID [5209]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 24. Solutions of linear DE by Laplace transforms. Supplementary Problems. page 248
Problem number: Problem 24.32.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _with_linear_symmetries]]`

$$\boxed{y'' + 2y' + 5y = 3\,\mathrm{e}^{-2x}}$$

With initial conditions

$$[y(0) = 1, y'(0) = 1]$$

✓ Solution by Maple

Time used: 0.016 (sec). Leaf size: 31

```
dsolve([diff(y(x),x$2)+2*diff(y(x),x)+5*y(x)=3*exp(-2*x),y(0) = 1, D(y)(0) = 1],y(x), singso
```

$$y(x) = \frac{(4\cos(2x) + 13\sin(2x))\,\mathrm{e}^{-x}}{10} + \frac{3\,\mathrm{e}^{-2x}}{5}$$

✓ Solution by Mathematica

Time used: 0.025 (sec). Leaf size: 34

```
DSolve[{y''[x]+2*y'[x]+5*y[x]==3*Exp[-2*x],{y[0]==1,y'[0]==1}},y[x],x,IncludeSingularSolutio
```

$$y(x) \to \frac{1}{10}e^{-2x}(13e^{x}\sin(2x) + 4e^{x}\cos(2x) + 6)$$

5.11 problem Problem 24.33

Internal problem ID [5210]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 24. Solutions of linear DE by Laplace transforms. Supplementary Problems. page 248
Problem number: Problem 24.33.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _linear, _nonhomogeneous]]`

$$\boxed{y'' + 5y' - 3y = \text{Heaviside}\left(x - 4\right)}$$

With initial conditions

$$[y(0) = 0, y'(0) = 0]$$

✓ Solution by Maple

Time used: 0.031 (sec). Leaf size: 70

```
dsolve([diff(y(x),x$2)+5*diff(y(x),x)-3*y(x)=Heaviside(x-4),y(0) = 0, D(y)(0) = 0],y(x), sin
```

$$y(x) = \frac{\text{Heaviside}\left(x - 4\right)\left(5\sqrt{37}\,\mathrm{e}^{\frac{(x-4)\left(-5+\sqrt{37}\right)}{2}} + 37\,\mathrm{e}^{\frac{(x-4)\left(-5+\sqrt{37}\right)}{2}} - 5\sqrt{37}\,\mathrm{e}^{-\frac{(x-4)\left(5+\sqrt{37}\right)}{2}} - 74 + 37\,\mathrm{e}^{-\frac{(x-4)\left(5+\sqrt{37}\right)}{2}}\right.}{222}$$

✓ Solution by Mathematica

Time used: 0.051 (sec). Leaf size: 70

```
DSolve[{y''[x]+5*y'[x]-3*y[x]==UnitStep[x-4],{y[0]==0,y'[0]==0}},y[x],x,IncludeSingularSolut
```

$$y(x)$$

$$\rightarrow \begin{cases} \frac{1}{222}\left(-74+\left(37+5\sqrt{37}\right)e^{\frac{1}{2}\left(-5+\sqrt{37}\right)(x-4)}+\left(37-5\sqrt{37}\right)e^{-\frac{1}{2}\left(5+\sqrt{37}\right)(x-4)}\right) & x>4 \\ 0 & \text{True} \end{cases}$$

5.12 problem Problem 24.35

Internal problem ID [5211]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 24. Solutions of linear DE by Laplace transforms. Supplementary Problems. page 248
Problem number: Problem 24.35.
ODE order: 3.
ODE degree: 1.

CAS Maple gives this as type `[[_3rd_order, _missing_x]]`

$$\boxed{y''' - y = 5}$$

With initial conditions

$$[y(0) = 0, y'(0) = 0, y''(0) = 0]$$

✓ Solution by Maple

Time used: 0.031 (sec). Leaf size: 23

```
dsolve([diff(y(x),x$3)-y(x)=5,y(0) = 0, D(y)(0) = 0, (D@@2)(y)(0) = 0],y(x), singsol=all)
```

$$y(x) = -5 + \frac{5\,\mathrm{e}^{x}}{3} + \frac{10\,\mathrm{e}^{-\frac{x}{2}}\cos\left(\frac{\sqrt{3}\,x}{2}\right)}{3}$$

✓ Solution by Mathematica

Time used: 0.004 (sec). Leaf size: 34

```
DSolve[{y'''[x]-y[x]==5,{y[0]==0,y'[0]==0,y''[0]==0}},y[x],x,IncludeSingularSolutions -> Tru
```

$$y(x) \to \frac{5}{3}\left(e^{x} + 2e^{-x/2}\cos\left(\frac{\sqrt{3}x}{2}\right) - 3\right)$$

5.13 problem Problem 24.36

Internal problem ID [5212]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 24. Solutions of linear DE by Laplace transforms. Supplementary Problems. page 248
Problem number: Problem 24.36.
ODE order: 4.
ODE degree: 1.

CAS Maple gives this as type `[[_high_order, _missing_x]]`

$$\boxed{y'''' - y = 0}$$

With initial conditions

$$[y(0) = 1, y'(0) = 0, y''(0) = 0, y'''(0) = 0]$$

✓ Solution by Maple

Time used: 0.015 (sec). Leaf size: 19

```
dsolve([diff(y(x),x$4)-y(x)=0,y(0) = 1, D(y)(0) = 0, (D@@2)(y)(0) = 0, (D@@3)(y)(0) = 0],y(x
```

$$y(x) = \frac{\mathrm{e}^{-x}}{4} + \frac{\mathrm{e}^{x}}{4} + \frac{\cos(x)}{2}$$

✓ Solution by Mathematica

Time used: 0.003 (sec). Leaf size: 22

```
DSolve[{y''''[x]-y[x]==0,{y[0]==1,y'[0]==0,y''[0]==0,y'''[0]==0}},y[x],x,IncludeSingularSolu
```

$$y(x) \to \frac{1}{4}\left(e^{-x} + e^{x} + 2\cos(x)\right)$$

5.14 problem Problem 24.37

Internal problem ID [5213]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 24. Solutions of linear DE by Laplace transforms. Supplementary Problems. page 248
Problem number: Problem 24.37.
ODE order: 3.
ODE degree: 1.

CAS Maple gives this as type `[[_3rd_order, _linear, _nonhomogeneous]]`

$$\boxed{y''' - 3y'' + 3y' - y = x^2 \mathrm{e}^x}$$

With initial conditions

$$[y(0) = 1, y'(0) = 2, y''(0) = 3]$$

✓ Solution by Maple

Time used: 0.015 (sec). Leaf size: 18

```
dsolve([diff(y(x),x$3)-3*diff(y(x),x$2)+3*diff(y(x),x)-y(x)=x^2*exp(x),y(0) = 1, D(y)(0) = 2
```

$$y(x) = \mathrm{e}^x \left(1 + \frac{1}{60} x^5 + x\right)$$

✓ Solution by Mathematica

Time used: 0.008 (sec). Leaf size: 20

```
DSolve[{y'''[x]-3*y''[x]+3*y'[x]-y[x]==x^2*Exp[x],{y[0]==1,y'[0]==2,y''[0]==3}},y[x],x,Inclu
```

$$y(x) \to \frac{1}{60} e^x \left(x^5 + 60x + 60\right)$$

5.15 problem Problem 24.44

Internal problem ID [5214]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 24. Solutions of linear DE by Laplace transforms. Supplementary Problems. page 248
Problem number: Problem 24.44.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _missing_x]]`

$$\boxed{x'' + 4x' + 4x = 0}$$

With initial conditions

$$[x(0) = 2, x'(0) = -2]$$

✓ Solution by Maple

Time used: 0.016 (sec). Leaf size: 13

```
dsolve([diff(x(t),t$2)+4*diff(x(t),t)+4*x(t)=0,x(0) = 2, D(x)(0) = -2],x(t), singsol=all)
```

$$x(t) = 2\,\mathrm{e}^{-2t}(1+t)$$

✓ Solution by Mathematica

Time used: 0.024 (sec). Leaf size: 47

```
DSolve[{x''[t]+3*x'[t]+4*x[t]==0,{x[0]==2,x'[0]==-2}},x[t],t,IncludeSingularSolutions -> Tru
```

$$x(t) \to \frac{2}{7}e^{-3t/2}\left(\sqrt{7}\sin\left(\frac{\sqrt{7}t}{2}\right) + 7\cos\left(\frac{\sqrt{7}t}{2}\right)\right)$$

5.16 problem Problem 24.46

Internal problem ID [5215]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 24. Solutions of linear DE by Laplace transforms. Supplementary Problems. page 248
Problem number: Problem 24.46.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _linear, _nonhomogeneous]]`

$$\boxed{q'' + 9q' + 14q = \frac{\sin(t)}{2}}$$

With initial conditions

$$[q(0) = 0, q'(0) = 1]$$

✓ Solution by Maple

Time used: 0.016 (sec). Leaf size: 25

```
dsolve([diff(q(t),t$2)+9*diff(q(t),t)+14*q(t)=1/2*sin(t),q(0) = 0, D(q)(0) = 1],q(t), singso
```

$$q(t) = -\frac{101\,\mathrm{e}^{-7t}}{500} + \frac{11\,\mathrm{e}^{-2t}}{50} - \frac{9\cos(t)}{500} + \frac{13\sin(t)}{500}$$

✓ Solution by Mathematica

Time used: 0.023 (sec). Leaf size: 32

```
DSolve[{q''[t]+9*q'[t]+14*q[t]==1/2*Sin[t],{q[0]==0,q'[0]==1}},q[t],t,IncludeSingularSolutio
```

$$q(t) \to \frac{1}{500}\left(-101e^{-7t} + 110e^{-2t} + 13\sin(t) - 9\cos(t)\right)$$

6 Chapter 27. Power series solutions of linear DE with variable coefficients. Supplementary Problems. page 274

6.1 problem Problem 27.28

Internal problem ID [5216]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 27. Power series solutions of linear DE with variable coefficients. Supplementary Problems. page 274
Problem number: Problem 27.28.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _with_linear_symmetries]]`

$$\boxed{(1+x)\,y'' + \frac{y'}{x} + yx = 0}$$

With the expansion point for the power series method at $x = 0$.

✓ Solution by Maple

Time used: 0.016 (sec). Leaf size: 49

```
Order:=6;
dsolve((x+1)*diff(y(x),x$2)+1/x*diff(y(x),x)+x*y(x)=0,y(x),type='series',x=0);
```

$$y(x) = (\ln(x)\,c_2 + c_1)\left(1 - \frac{1}{9}x^3 + \frac{1}{24}x^4 - \frac{1}{50}x^5 + \mathrm{O}\left(x^6\right)\right) + \left(x + \frac{2}{27}x^3 - \frac{11}{144}x^4 + \frac{33}{1000}x^5 + \mathrm{O}\left(x^6\right)\right)c_2$$

✓ Solution by Mathematica

Time used: 0.005 (sec). Leaf size: 82

```
AsymptoticDSolveValue[(1+x)*y''[x]+1/x*y'[x]+x*y[x]==0,y[x],{x,0,5}]
```

$$y(x) \to c_1\left(-\frac{x^5}{50} + \frac{x^4}{24} - \frac{x^3}{9} + 1\right) + c_2\left(\frac{33x^5}{1000} - \frac{11x^4}{144} + \frac{2x^3}{27} + \left(-\frac{x^5}{50} + \frac{x^4}{24} - \frac{x^3}{9} + 1\right)\log(x) + x\right)$$

6.2 problem Problem 27.30

Internal problem ID [5217]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 27. Power series solutions of linear DE with variable coefficients. Supplementary Problems. page 274
Problem number: Problem 27.30.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_Emden, _Fowler]]`

$$\boxed{x^3y'' + y = 0}$$

With the expansion point for the power series method at $x = 0$.

✗ Solution by Maple

```
Order:=6;
dsolve(x^3*diff(y(x),x$2)+y(x)=0,y(x),type='series',x=0);
```

No solution found

✓ Solution by Mathematica

Time used: 0.035 (sec). Leaf size: 222

```
AsymptoticDSolveValue[x^3*y''[x]+y[x]==0,y[x],{x,0,5}]
```

$$y(x) \to c_1 e^{-\frac{2i}{\sqrt{x}}} x^{3/4}\left(-\frac{468131288625ix^{9/2}}{8796093022208}+\frac{66891825ix^{7/2}}{4294967296}-\frac{72765ix^{5/2}}{8388608}+\frac{105ix^{3/2}}{8192}\right.$$
$$+\frac{33424574007825x^5}{281474976710656}-\frac{14783093325x^4}{549755813888}+\frac{2837835x^3}{268435456}-\frac{4725x^2}{524288}+\frac{15x}{512}-\frac{3i\sqrt{x}}{16}$$
$$\left.+1\right)+c_2 e^{\frac{2i}{\sqrt{x}}} x^{3/4}\left(\frac{468131288625ix^{9/2}}{8796093022208}-\frac{66891825ix^{7/2}}{4294967296}+\frac{72765ix^{5/2}}{8388608}-\frac{105ix^{3/2}}{8192}+\frac{33424574007825x^5}{281474976710656}-\right.$$

6.3 problem Problem 27.36

Internal problem ID [5218]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 27. Power series solutions of linear DE with variable coefficients. Supplementary Problems. page 274
Problem number: Problem 27.36.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_Emden, _Fowler]]`

$$\boxed{y'' + yx = 0}$$

With the expansion point for the power series method at $x = 0$.

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 24

```
Order:=6;
dsolve(diff(y(x),x$2)+x*y(x)=0,y(x),type='series',x=0);
```

$$y(x) = \left(1 - \frac{x^3}{6}\right) y(0) + \left(x - \frac{1}{12}x^4\right) D(y)(0) + O\left(x^6\right)$$

✓ Solution by Mathematica

Time used: 0.001 (sec). Leaf size: 28

```
AsymptoticDSolveValue[y''[x]+x*y[x]==0,y[x],{x,0,5}]
```

$$y(x) \to c_2\left(x - \frac{x^4}{12}\right) + c_1\left(1 - \frac{x^3}{6}\right)$$

6.4 problem Problem 27.37

Internal problem ID [5219]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 27. Power series solutions of linear DE with variable coefficients. Supplementary Problems. page 274
Problem number: Problem 27.37.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _exact, _linear, _homogeneous]]`

$$\boxed{y'' - 2y'x - 2y = 0}$$

With the expansion point for the power series method at $x = 0$.

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 32

```
Order:=6;
dsolve(diff(y(x),x$2)-2*x*diff(y(x),x)-2*y(x)=0,y(x),type='series',x=0);
```

$$y(x) = \left(1 + x^2 + \frac{1}{2}x^4\right) y(0) + \left(x + \frac{2}{3}x^3 + \frac{4}{15}x^5\right) D(y)(0) + O\left(x^6\right)$$

✓ Solution by Mathematica

Time used: 0.001 (sec). Leaf size: 38

```
AsymptoticDSolveValue[y''[x]-2*x*y'[x]-2*y[x]==0,y[x],{x,0,5}]
```

$$y(x) \to c_2\left(\frac{4x^5}{15} + \frac{2x^3}{3} + x\right) + c_1\left(\frac{x^4}{2} + x^2 + 1\right)$$

6.5 problem Problem 27.38

Internal problem ID [5220]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 27. Power series solutions of linear DE with variable coefficients. Supplementary Problems. page 274
Problem number: Problem 27.38.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _exact, _linear, _homogeneous]]`

$$\boxed{y'' + x^2 y' + 2yx = 0}$$

With the expansion point for the power series method at $x = 0$.

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 24

```
Order:=6;
dsolve(diff(y(x),x$2)+x^2*diff(y(x),x)+2*x*y(x)=0,y(x),type='series',x=0);
```

$$y(x) = \left(1 - \frac{x^3}{3}\right) y(0) + \left(x - \frac{1}{4}x^4\right) D(y)(0) + O\left(x^6\right)$$

✓ Solution by Mathematica

Time used: 0.001 (sec). Leaf size: 28

```
AsymptoticDSolveValue[y''[x]+x^2*y'[x]+2*x*y[x]==0,y[x],{x,0,5}]
```

$$y(x) \to c_2\left(x - \frac{x^4}{4}\right) + c_1\left(1 - \frac{x^3}{3}\right)$$

6.6 problem Problem 27.39

Internal problem ID [5221]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 27. Power series solutions of linear DE with variable coefficients. Supplementary Problems. page 274
Problem number: Problem 27.39.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _with_linear_symmetries]]`

$$\boxed{y'' - x^2 y' - y = 0}$$

With the expansion point for the power series method at $x = 0$.

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 44

```
Order:=6;
dsolve(diff(y(x),x$2)-x^2*diff(y(x),x)-y(x)=0,y(x),type='series',x=0);
```

$$y(x) = \left(1 + \frac{1}{2}x^2 + \frac{1}{24}x^4 + \frac{1}{20}x^5\right) y(0) + \left(x + \frac{1}{6}x^3 + \frac{1}{12}x^4 + \frac{1}{120}x^5\right) D(y)(0) + O\left(x^6\right)$$

✓ Solution by Mathematica

Time used: 0.001 (sec). Leaf size: 56

```
AsymptoticDSolveValue[y''[x]-x^2*y'[x]-y[x]==0,y[x],{x,0,5}]
```

$$y(x) \to c_2\left(\frac{x^5}{120} + \frac{x^4}{12} + \frac{x^3}{6} + x\right) + c_1\left(\frac{x^5}{20} + \frac{x^4}{24} + \frac{x^2}{2} + 1\right)$$

6.7 problem Problem 27.40

Internal problem ID [5222]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 27. Power series solutions of linear DE with variable coefficients. Supplementary Problems. page 274
Problem number: Problem 27.40.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_Emden, _Fowler]]`

$$\boxed{y'' + 2yx^2 = 0}$$

With the expansion point for the power series method at $x = 0$.

✓ Solution by Maple

Time used: 0.016 (sec). Leaf size: 24

```
Order:=6;
dsolve(diff(y(x),x$2)+2*x^2*y(x)=0,y(x),type='series',x=0);
```

$$y(x) = \left(1 - \frac{x^4}{6}\right) y(0) + \left(x - \frac{1}{10}x^5\right) D(y)(0) + O\left(x^6\right)$$

✓ Solution by Mathematica

Time used: 0.001 (sec). Leaf size: 28

```
AsymptoticDSolveValue[y''[x]+2*x^2*y[x]==0,y[x],{x,0,5}]
```

$$y(x) \to c_2\left(x - \frac{x^5}{10}\right) + c_1\left(1 - \frac{x^4}{6}\right)$$

6.8 problem Problem 27.41

Internal problem ID [5223]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 27. Power series solutions of linear DE with variable coefficients. Supplementary Problems. page 274
Problem number: Problem 27.41.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _exact, _linear, _homogeneous]]`

$$\boxed{\left(x^2-1\right)y''+y'x-y=0}$$

With the expansion point for the power series method at $x=0$.

✓ Solution by Maple

Time used: 0.015 (sec). Leaf size: 24

```
Order:=6;
dsolve((x^2-1)*diff(y(x),x$2)+x*diff(y(x),x)-y(x)=0,y(x),type='series',x=0);
```

$$y(x)=\left(1-\frac{1}{2}x^2-\frac{1}{8}x^4\right)y(0)+D(y)\left(0\right)x+O\left(x^6\right)$$

✓ Solution by Mathematica

Time used: 0.001 (sec). Leaf size: 27

```
AsymptoticDSolveValue[(x^2-1)*y''[x]+x*y'[x]-y[x]==0,y[x],{x,0,5}]
```

$$y(x)\to c_1\left(-\frac{x^4}{8}-\frac{x^2}{2}+1\right)+c_2x$$

6.9 problem Problem 27.42

Internal problem ID [5224]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 27. Power series solutions of linear DE with variable coefficients. Supplementary Problems. page 274
Problem number: Problem 27.42.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_Emden, _Fowler]]`

$$\boxed{y'' - yx = 0}$$

With the expansion point for the power series method at $x = 0$.

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 24

```
Order:=6;
dsolve(diff(y(x),x$2)-x*y(x)=0,y(x),type='series',x=0);
```

$$y(x) = \left(1 + \frac{x^3}{6}\right) y(0) + \left(x + \frac{1}{12}x^4\right) D(y)(0) + O\left(x^6\right)$$

✓ Solution by Mathematica

Time used: 0.001 (sec). Leaf size: 28

```
AsymptoticDSolveValue[y''[x]-x*y[x]==0,y[x],{x,0,5}]
```

$$y(x) \to c_2\left(\frac{x^4}{12} + x\right) + c_1\left(\frac{x^3}{6} + 1\right)$$

6.10 problem Problem 27.48

Internal problem ID [5225]

Book: Schaums Outline Differential Equations, 4th edition. Bronson and Costa. McGraw Hill 2014
Section: Chapter 27. Power series solutions of linear DE with variable coefficients. Supplementary Problems. page 274
Problem number: Problem 27.48.
ODE order: 2.
ODE degree: 1.

CAS Maple gives this as type `[[_2nd_order, _with_linear_symmetries]]`

$$\boxed{y'' - 2y'x + yx^2 = 0}$$

With initial conditions

$$[y(0) = 1, y'(0) = -1]$$

With the expansion point for the power series method at $x = 0$.

✓ Solution by Maple

Time used: 0.016 (sec). Leaf size: 18

```
Order:=6;
dsolve([diff(y(x),x$2)-2*x*diff(y(x),x)+x^2*y(x)=0,y(0) = 1, D(y)(0) = -1],y(x),type='series
```

$$y(x) = 1 - x - \frac{1}{3}x^3 - \frac{1}{12}x^4 - \frac{1}{20}x^5 + \mathrm{O}\left(x^6\right)$$

✓ Solution by Mathematica

Time used: 0.001 (sec). Leaf size: 29

```
AsymptoticDSolveValue[{y''[x]-2*x*y'[x]+x^2*y[x]==0,{y[0]==1,y'[0]==-1}},y[x],{x,0,5}]
```

$$y(x) \to -\frac{x^5}{20} - \frac{x^4}{12} - \frac{x^3}{3} - x + 1$$