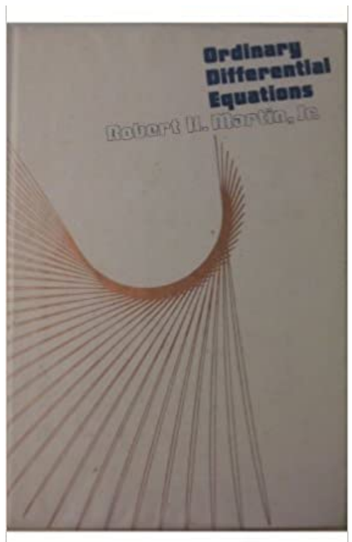
A Solution Manual For

Ordinary Differential Equations, Robert H. Martin, 1983



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Contents

1 Problem 1.1-2, page 6

1.1 problem 1.1-2 (a)

Internal problem ID [1938]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.1-2, page 6
Problem number: 1.1-2 (a).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

$$\boxed{y' - t^2 - 3 = 0}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 14

```
dsolve(diff(y(t),t)=t^2+3,y(t), singsol=all)
```

$$y(t) = \frac{1}{3}t^3 + 3t + c_1$$

✓ Solution by Mathematica

Time used: 0.002 (sec). Leaf size: 18

```
DSolve[y'[t]==t^2+3,y[t],t,IncludeSingularSolutions -> True]
```

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

1.2 problem 1.1-2 (b)

Internal problem ID [1939]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.1-2, page 6
Problem number: 1.1-2 (b).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

$$\boxed{y' - e^{2t}t = 0}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 17

```
dsolve(diff(y(t),t)=t*exp(2*t),y(t), singsol=all)
```

$$y(t) = \frac{(2t-1)\,e^{2t}}{4} + c_1$$

✓ Solution by Mathematica

Time used: 0.005 (sec). Leaf size: 22

```
DSolve[y'[t]==t*Exp[2*t],y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to \frac{1}{4}e^{2t}(2t-1) + c_1$$

1.3 problem 1.1-2 (c)

Internal problem ID [1940]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.1-2, page 6
Problem number: 1.1-2 (c).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

$$\boxed{y' - \sin(3t) = 0}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 12

```
dsolve(diff(y(t),t)=sin(3*t),y(t), singsol=all)
```

$$y(t) = -\frac{\cos(3t)}{3} + c_1$$

✓ Solution by Mathematica

Time used: 0.006 (sec). Leaf size: 16

```
DSolve[y'[t]==Sin[3*t],y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to -\frac{1}{3}\cos(3t) + c_1$$

1.4 problem 1.1-2 (d)

Internal problem ID [1941]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.1-2, page 6
Problem number: 1.1-2 (d).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

$$\boxed{y' - \sin(t)^2 = 0}$$

✓ Solution by Maple

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

```
dsolve(diff(y(t),t)=sin(t)^2,y(t), singsol=all)
```

$$y(t) = \frac{t}{2} + c_1 - \frac{\sin(2t)}{4}$$

✓ Solution by Mathematica

Time used: 0.014 (sec). Leaf size: 21

```
DSolve[y'[t]==Sin[t]^2,y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to \frac{t}{2} - \frac{1}{4}\sin(2t) + c_1$$

1.5 problem 1.1-2 (e)

Internal problem ID [1942]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.1-2, page 6
Problem number: 1.1-2 (e).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

$$\boxed{y' - \frac{t}{t^2 + 4} = 0}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 14

```
dsolve(diff(y(t),t)=t/(t^2+4),y(t), singsol=all)
```

$$y(t) = \frac{\ln(t^2 + 4)}{2} + c_1$$

✓ Solution by Mathematica

Time used: 0.004 (sec). Leaf size: 18

```
DSolve[y'[t]==t/(t^2+4),y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to \frac{1}{2} \log\left(t^2 + 4\right) + c_1$$

1.6 problem 1.1-2 (f)

Internal problem ID [1943]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.1-2, page 6
Problem number: 1.1-2 (f).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

$$\boxed{y' - \ln(t) = 0}$$

✓ Solution by Maple

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

```
dsolve(diff(y(t),t)=ln(t),y(t), singsol=all)
```

$$y(t) = t\ln(t) - t + c_1$$

✓ Solution by Mathematica

Time used: 0.004 (sec). Leaf size: 15

```
DSolve[y'[t]==Log[t],y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to -t + t\log(t) + c_1$$

1.7 problem 1.1-2 (g)

Internal problem ID [1944]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.1-2, page 6
Problem number: 1.1-2 (g).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

$$\boxed{y' - \frac{t}{\sqrt{t}+1} = 0}$$

✓ Solution by Maple

Time used: 0.015 (sec). Leaf size: 27

```
dsolve(diff(y(t),t)=t/(sqrt(t)+1),y(t), singsol=all)
```

$$y(t) = \frac{2t^{\frac{3}{2}}}{3} - t + 2\sqrt{t} - 2\ln\left(\sqrt{t}+1\right) + c_1$$

✓ Solution by Mathematica

Time used: 0.011 (sec). Leaf size: 25

```
DSolve[y'[t]==1/(1+Sqrt[t]),y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to 2\sqrt{t} - 2\log\left(\sqrt{t}+1\right) + c_1$$

2 Problem 1.1-3, page 6

2.1 problem 1.1-3 (a)

Internal problem ID [1945]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.1-3, page 6
Problem number: 1.1-3 (a).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

$$\boxed{y' - 2y + 4 = 0}$$

With initial conditions

$$[y(0) = 5]$$

✓ Solution by Maple

Time used: 0.015 (sec). Leaf size: 12

```
dsolve([diff(y(t),t)=2*y(t)-4,y(0) = 5],y(t), singsol=all)
```

$$y(t) = 2 + 3\,\mathrm{e}^{2t}$$

✓ Solution by Mathematica

Time used: 0.024 (sec). Leaf size: 14

```
DSolve[{y'[t]==2*y[t]-4,y[0]==5},y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to 3e^{2t} + 2$$

2.2 problem 1.1-3 (b)

Internal problem ID [1946]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.1-3, page 6
Problem number: 1.1-3 (b).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

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

With initial conditions

$$[y(1) = 3]$$

✓ Solution by Maple

Time used: 0.047 (sec). Leaf size: 13

```
dsolve([diff(y(t),t)=-y(t)^3,y(1) = 3],y(t), singsol=all)
```

$$y(t) = \frac{3}{\sqrt{18t - 17}}$$

✓ Solution by Mathematica

Time used: 0.003 (sec). Leaf size: 16

```
DSolve[{y'[t]==-y[t]^3,y[1]==3},y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to \frac{3}{\sqrt{18t - 17}}$$

2.3 problem 1.1-3 (c)

Internal problem ID [1947]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.1-3, page 6
Problem number: 1.1-3 (c).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_separable]`

$$\boxed{y' - \frac{e^t}{y} = 0}$$

With initial conditions

$$[y(\ln(2)) = -8]$$

✓ Solution by Maple

Time used: 0.094 (sec). Leaf size: 14

```
dsolve([diff(y(t),t)=exp(t)/y(t),y(ln(2)) = -8],y(t), singsol=all)
```

$$y(t) = -\sqrt{2\,e^t + 60}$$

✓ Solution by Mathematica

Time used: 0.568 (sec). Leaf size: 21

```
DSolve[{y'[t]==Exp[t]/y[t],y[Log[2]]==-8},y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to -\sqrt{2}\sqrt{e^t + 30}$$

2.4 problem 1.1-3 (d)

Internal problem ID [1948]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.1-3, page 6
Problem number: 1.1-3 (d).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

$$\boxed{y' - e^{2t}t = 0}$$

With initial conditions

$$[y(1) = 5]$$

✓ Solution by Maple

Time used: 0.031 (sec). Leaf size: 21

```
dsolve([diff(y(t),t)=t*exp(2*t),y(1) = 5],y(t), singsol=all)
```

$$y(t) = \frac{(2t-1)\,e^{2t}}{4} + 5 - \frac{e^2}{4}$$

✓ Solution by Mathematica

Time used: 0.006 (sec). Leaf size: 27

```
DSolve[{y'[t]==t*Exp[2*t],y[1]==5},y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to \frac{1}{4}\left(e^{2t}(2t-1) - e^2 + 20\right)$$

2.5 problem 1.1-3 (e)

Internal problem ID [1949]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.1-3, page 6
Problem number: 1.1-3 (e).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

$$\boxed{y' - \sin(t)^2 = 0}$$

With initial conditions

$$\left[y\left(\frac{\pi}{6}\right) = 3\right]$$

✓ Solution by Maple

Time used: 0.015 (sec). Leaf size: 23

```
dsolve([diff(y(t),t)=sin(t)^2,y(1/6*Pi) = 3],y(t), singsol=all)
```

$$y(t) = \frac{t}{2} + 3 - \frac{\pi}{12} + \frac{\sqrt{3}}{8} - \frac{\sin(2t)}{4}$$

✓ Solution by Mathematica

Time used: 0.008 (sec). Leaf size: 31

```
DSolve[{y'[t]==Sin[t]^2,y[Pi/6]==3},y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to \frac{1}{24}\left(3\left(4t + \sqrt{3} + 24\right) - 6\sin(2t) - 2\pi\right)$$

2.6 problem 1.1-3 (f)

Internal problem ID [1950]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.1-3, page 6
Problem number: 1.1-3 (f).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

$$\boxed{y' - 8\,e^{4t} - t = 0}$$

With initial conditions

$$[y(0) = 12]$$

✓ Solution by Maple

Time used: 0.016 (sec). Leaf size: 17

```
dsolve([diff(y(t),t)=8*exp(4*t)+t,y(0) = 12],y(t), singsol=all)
```

$$y(t) = \frac{t^2}{2} + 2\,e^{4t} + 10$$

✓ Solution by Mathematica

Time used: 0.011 (sec). Leaf size: 21

```
DSolve[{y'[t]==8*Exp[4*t]+t,y[0]==12},y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to \frac{1}{2}\left(t^2 + 4e^{4t} + 20\right)$$

3 Problem 1.1-4, page 7

3.1 problem 1.1-4 (a)

Internal problem ID [1951]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.1-4, page 7
Problem number: 1.1-4 (a).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_separable]`

$$\boxed{y' - \frac{y}{t} = 0}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 7

```
dsolve(diff(y(t),t)=y(t)/t,y(t), singsol=all)
```

$$y(t) = tc_1$$

✓ Solution by Mathematica

Time used: 0.02 (sec). Leaf size: 14

```
DSolve[y'[t]==y[t]/t,y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to c_1 t$$
$$y(t) \to 0$$

3.2 problem 1.1-4 (b)

Internal problem ID [1952]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.1-4, page 7
Problem number: 1.1-4 (b).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_separable]`

$$\boxed{y' + \frac{t}{y} = 0}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 27

```
dsolve(diff(y(t),t)=-t/y(t),y(t), singsol=all)
```

$$y(t) = \sqrt{-t^2 + c_1}$$
$$y(t) = -\sqrt{-t^2 + c_1}$$

✓ Solution by Mathematica

Time used: 0.08 (sec). Leaf size: 39

```
DSolve[y'[t]==-t/y[t],y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to -\sqrt{-t^2 + 2c_1}$$
$$y(t) \to \sqrt{-t^2 + 2c_1}$$

4 Problem 1.1-5, page 7

4.1 problem 1.1-5

Internal problem ID [1953]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.1-5, page 7
Problem number: 1.1-5.
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

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

✓ Solution by Maple

Time used: 0.016 (sec). Leaf size: 12

```
dsolve(diff(y(t),t)=y(t)^2-y(t),y(t), singsol=all)
```

$$y(t) = \frac{1}{1 + c_1 e^t}$$

✓ Solution by Mathematica

Time used: 0.205 (sec). Leaf size: 25

```
DSolve[y'[t]==y[t]^2-y[t],y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to \frac{1}{1 + e^{t+c_1}}$$
$$y(t) \to 0$$
$$y(t) \to 1$$

5 Problem 1.1-6, page 7

5.1 problem 1.1-6 (a)

Internal problem ID [1954]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.1-6, page 7
Problem number: 1.1-6 (a).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

$$\boxed{y' + 1 - y = 0}$$

✓ Solution by Maple

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

```
dsolve(diff(y(t),t)=y(t)-1,y(t), singsol=all)
```

$$y(t) = 1 + c_1 e^t$$

✓ Solution by Mathematica

Time used: 0.022 (sec). Leaf size: 18

```
DSolve[y'[t]==y[t]-1,y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to 1 + c_1 e^t$$
$$y(t) \to 1$$

5.2 problem 1.1-6 (b)

Internal problem ID [1955]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.1-6, page 7
Problem number: 1.1-6 (b).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

$$\boxed{y' - 1 + y = 0}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 12

```
dsolve(diff(y(t),t)=1-y(t),y(t), singsol=all)
```

$$y(t) = 1 + e^{-t}c_1$$

✓ Solution by Mathematica

Time used: 0.022 (sec). Leaf size: 20

```
DSolve[y'[t]==1-y[t],y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to 1 + c_1e^{-t}$$
$$y(t) \to 1$$

5.3 problem 1.1-6 (c)

Internal problem ID [1956]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.1-6, page 7
Problem number: 1.1-6 (c).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

$$\boxed{y' - y^3 + y^2 = 0}$$

✓ Solution by Maple

Time used: 0.125 (sec). Leaf size: 16

```
dsolve(diff(y(t),t)=y(t)^3-y(t)^2,y(t), singsol=all)
```

$$y(t) = \frac{1}{\operatorname{LambertW}\left(-c_1 e^{t-1}\right) + 1}$$

✓ Solution by Mathematica

Time used: 0.21 (sec). Leaf size: 38

```
DSolve[y'[t]==y[t]^3-y[t]^2,y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to \text{InverseFunction}\left[\frac{1}{\#1} + \log(1 - \#1) - \log(\#1)\&\right][t + c_1]$$

$$y(t) \to 0$$

$$y(t) \to 1$$

5.4 problem 1.1-6 (d)

Internal problem ID [1957]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.1-6, page 7
Problem number: 1.1-6 (d).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

$$\boxed{y' - 1 + y^2 = 0}$$

✓ Solution by Maple

Time used: 0.015 (sec). Leaf size: 8

```
dsolve(diff(y(t),t)=1-y(t)^2,y(t), singsol=all)
```

$$y(t) = \tanh(t + c_1)$$

✓ Solution by Mathematica

Time used: 0.605 (sec). Leaf size: 22

```
DSolve[y'[t]==1-y[t]^2,y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \rightarrow \tanh(t - c_1)$$
$$y(t) \rightarrow -1$$
$$y(t) \rightarrow 1$$

6 Problem 1.2-1, page 12

6.1 problem 1.2-1 (a)

Internal problem ID [1958]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.2-1, page 12
Problem number: 1.2-1 (a).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_separable]`

$$\boxed{y' - y(t^2 + 1) = 0}$$

✓ Solution by Maple

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

```
dsolve(diff(y(t),t)=(t^2+1)*y(t),y(t), singsol=all)
```

$$y(t) = c_1 e^{\frac{t(t^2+3)}{3}}$$

✓ Solution by Mathematica

Time used: 0.025 (sec). Leaf size: 24

```
DSolve[y'[t]==(t^2+1)*y[t],y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to c_1 e^{\frac{t^3}{3}+t}$$
$$y(t) \to 0$$

6.2 problem 1.2-1 (b)

Internal problem ID [1959]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.2-1, page 12
Problem number: 1.2-1 (b).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

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

✓ Solution by Maple

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

```
dsolve(diff(y(t),t)=-y(t),y(t), singsol=all)
```

$$y(t) = \mathrm{e}^{-t} c_1$$

✓ Solution by Mathematica

Time used: 0.019 (sec). Leaf size: 18

```
DSolve[y'[t]==-y[t],y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to c_1 e^{-t}$$
$$y(t) \to 0$$

6.3 problem 1.2-1 (c)

Internal problem ID [1960]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.2-1, page 12
Problem number: 1.2-1 (c).
ODE order: 1.
ODE degree: 1.

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

$$\boxed{y' - 2y - e^{-3t} = 0}$$

✓ Solution by Maple

Time used: 0.016 (sec). Leaf size: 17

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

$$y(t) = \left(-\frac{e^{-5t}}{5} + c_1\right) e^{2t}$$

✓ Solution by Mathematica

Time used: 0.063 (sec). Leaf size: 23

```
DSolve[y'[t]==2*y[t]+Exp[-3*t],y[t],t,IncludeSingularSolutions -> True]
```

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

6.4 problem 1.2-1 (d)

Internal problem ID [1961]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.2-1, page 12
Problem number: 1.2-1 (d).
ODE order: 1.
ODE degree: 1.

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

$$\boxed{-2y + y' - e^{2t} = 0}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 12

```
dsolve(diff(y(t),t)=2*y(t)+exp(2*t),y(t), singsol=all)
```

$$y(t) = (t + c_1)\, e^{2t}$$

✓ Solution by Mathematica

Time used: 0.039 (sec). Leaf size: 15

```
DSolve[y'[t]==2*y[t]+Exp[2*t],y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to e^{2t}(t + c_1)$$

6.5 problem 1.2-1 (e)

Internal problem ID [1962]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.2-1, page 12
Problem number: 1.2-1 (e).
ODE order: 1.
ODE degree: 1.

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

$$\boxed{y' - t + y = 0}$$

✓ Solution by Maple

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

```
dsolve(diff(y(t),t)=-y(t)+t,y(t), singsol=all)
```

$$y(t) = t - 1 + e^{-t}c_1$$

✓ Solution by Mathematica

Time used: 0.024 (sec). Leaf size: 16

```
DSolve[y'[t]==-y[t]+t,y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to t + c_1e^{-t} - 1$$

6.6 problem 1.2-1 (f)

Internal problem ID [1963]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.2-1, page 12
Problem number: 1.2-1 (f).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_linear]`

$$\boxed{2y + ty' - \sin(t) = 0}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 17

```
dsolve(t*diff(y(t),t)+2*y(t)=sin(t),y(t), singsol=all)
```

$$y(t) = \frac{\sin(t) - \cos(t)\, t + c_1}{t^2}$$

✓ Solution by Mathematica

Time used: 0.033 (sec). Leaf size: 19

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

$$y(t) \to \frac{\sin(t) - t\cos(t) + c_1}{t^2}$$

6.7 problem 1.2-1 (g)

Internal problem ID [1964]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.2-1, page 12
Problem number: 1.2-1 (g).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_linear]`

$$\boxed{y' - \tan(t)\, y - \sec(t) = 0}$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 12

```
dsolve(diff(y(t),t)=y(t)*tan(t)+sec(t),y(t), singsol=all)
```

$$y(t) = \frac{t + c_1}{\cos(t)}$$

✓ Solution by Mathematica

Time used: 0.036 (sec). Leaf size: 12

```
DSolve[y'[t]==y[t]*Tan[t]+Sec[t],y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \rightarrow (t + c_1)\sec(t)$$

6.8 problem 1.2-1 (h)

Internal problem ID [1965]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.2-1, page 12
Problem number: 1.2-1 (h).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_linear]`

$$\boxed{y' - \frac{2ty}{t^2+1} - t - 1 = 0}$$

✓ Solution by Maple

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

```
dsolve(diff(y(t),t)=2*t/(t^2+1)*y(t)+t+1,y(t), singsol=all)
```

$$y(t) = \left(\frac{\ln(t^2+1)}{2} + \arctan(t) + c_1\right)(t^2+1)$$

✓ Solution by Mathematica

Time used: 0.036 (sec). Leaf size: 26

```
DSolve[y'[t]==2*t/(t^2+1)*y[t]+t+1,y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to (t^2+1)\left(\arctan(t) + \frac{1}{2}\log(t^2+1) + c_1\right)$$

6.9 problem 1.2-1 (i)

Internal problem ID [1966]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.2-1, page 12
Problem number: 1.2-1 (i).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_linear]`

$$\boxed{y' - \tan(t)\, y - \sec(t)^3 = 0}$$

✓ Solution by Maple

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

```
dsolve(diff(y(t),t)=y(t)*tan(t)+sec(t)^3,y(t), singsol=all)
```

$$y(t) = \frac{\tan(t) + c_1}{\cos(t)}$$

✓ Solution by Mathematica

Time used: 0.053 (sec). Leaf size: 13

```
DSolve[y'[t]==y[t]*Tan[t]+Sec[t]^3,y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to \sec(t)(\tan(t) + c_1)$$

7 Problem 1.2-2, page 12

7.1 problem 1.2-2 (a)

Internal problem ID [1967]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.2-2, page 12
Problem number: 1.2-2 (a).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

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

With initial conditions

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

✓ Solution by Maple

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

```
dsolve([diff(y(t),t)=y(t),y(0) = 2],y(t), singsol=all)
```

$$y(t) = 2\,\mathrm{e}^{t}$$

✓ Solution by Mathematica

Time used: 0.02 (sec). Leaf size: 10

```
DSolve[{y'[t]==y[t],y[0]==2},y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to 2e^{t}$$

7.2 problem 1.2-2 (b)

Internal problem ID [1968]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.2-2, page 12
Problem number: 1.2-2 (b).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_quadrature]`

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

With initial conditions

$$[y(\ln(3)) = 3]$$

✓ Solution by Maple

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

```
dsolve([diff(y(t),t)=2*y(t),y(ln(3)) = 3],y(t), singsol=all)
```

$$y(t) = \frac{e^{2t}}{3}$$

✓ Solution by Mathematica

Time used: 0.022 (sec). Leaf size: 14

```
DSolve[{y'[t]==2*y[t],y[Log[3]]==3},y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to \frac{e^{2t}}{3}$$

7.3 problem 1.2-2 (c)

Internal problem ID [1969]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.2-2, page 12
Problem number: 1.2-2 (c).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_linear]`

$$\boxed{ty' - y - t^3 = 0}$$

With initial conditions

$$[y(1) = -2]$$

✓ Solution by Maple

Time used: 0.0 (sec). Leaf size: 12

```
dsolve([t*diff(y(t),t)=y(t)+t^3,y(1) = -2],y(t), singsol=all)
```

$$y(t) = \frac{(t^2 - 5)\, t}{2}$$

✓ Solution by Mathematica

Time used: 0.048 (sec). Leaf size: 24

```
DSolve[{y'[t]==y[t]+t^3,y[1]==-2},y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to -t(t(t+3)+6) + 14e^{t-1} - 6$$

7.4 problem 1.2-2 (d)

Internal problem ID [1970]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.2-2, page 12
Problem number: 1.2-2 (d).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_linear]`

$$\boxed{y' + \tan(t)\, y - \sec(t) = 0}$$

With initial conditions

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

✓ Solution by Maple

Time used: 0.015 (sec). Leaf size: 6

```
dsolve([diff(y(t),t)=-tan(t)*y(t)+sec(t),y(0) = 0],y(t), singsol=all)
```

$$y(t) = \sin(t)$$

✓ Solution by Mathematica

Time used: 0.041 (sec). Leaf size: 7

```
DSolve[{y'[t]==-Tan[t]*y[t]+Sec[t],y[0]==0},y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to \sin(t)$$

7.5 problem 1.2-2 (e)

Internal problem ID [1971]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.2-2, page 12
Problem number: 1.2-2 (e).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_separable]`

$$\boxed{y' - \frac{2y}{t+1} = 0}$$

With initial conditions

$$[y(0) = 6]$$

✓ Solution by Maple

Time used: 0.016 (sec). Leaf size: 11

```
dsolve([diff(y(t),t)=2/(1+t)*y(t),y(0) = 6],y(t), singsol=all)
```

$$y(t) = 6(t+1)^2$$

✓ Solution by Mathematica

Time used: 0.025 (sec). Leaf size: 12

```
DSolve[{y'[t]==2/(1+t)*y[t],y[0]==6},y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to 6(t+1)^2$$

7.6 problem 1.2-2 (f)

Internal problem ID [1972]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.2-2, page 12
Problem number: 1.2-2 (f).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_linear]`

$$\boxed{ty' + y - t^3 = 0}$$

With initial conditions

$$[y(1) = 2]$$

✓ Solution by Maple

Time used: 0.016 (sec). Leaf size: 14

```
dsolve([t*diff(y(t),t)=-y(t)+t^3,y(1) = 2],y(t), singsol=all)
```

$$y(t) = \frac{t^4 + 7}{4t}$$

✓ Solution by Mathematica

Time used: 0.045 (sec). Leaf size: 25

```
DSolve[{y'[t]==-y[t]+t^3,y[1]==2},y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to t((t-3)t+6) + 4e^{1-t} - 6$$

8 Problem 1.2-3, page 12

8.1 problem 1.2-3 (a)

Internal problem ID [1973]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.2-3, page 12
Problem number: 1.2-3 (a).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_separable]`

$$\boxed{y' + 4\tan(2t)\, y - \tan(2t) = 0}$$

With initial conditions

$$\left[y\left(\frac{\pi}{8}\right) = 2\right]$$

✓ Solution by Maple

Time used: 0.016 (sec). Leaf size: 14

```
dsolve([diff(y(t),t)+4*tan(2*t)*y(t)=tan(2*t),y(1/8*Pi) = 2],y(t), singsol=all)
```

$$y(t) = \frac{7\cos(2t)^2}{2} + \frac{1}{4}$$

✓ Solution by Mathematica

Time used: 0.096 (sec). Leaf size: 15

```
DSolve[{y'[t]+4*Tan[2*t]*y[t]==Tan[2*t],y[Pi/8]==2},y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to \frac{7}{4}\cos(4t) + 2$$

8.2 problem 1.2-3 (b)

Internal problem ID [1974]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.2-3, page 12
Problem number: 1.2-3 (b).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_linear]`

$$\boxed{t \ln(t) y' - \ln(t) t + y = 0}$$

With initial conditions

$$[y(\mathrm{e}) = 1]$$

✓ Solution by Maple

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

```
dsolve([t*ln(t)*diff(y(t),t)=t*ln(t)-y(t),y(exp(1)) = 1],y(t), singsol=all)
```

$$y(t) = \frac{t \ln(t) - t + 1}{\ln(t)}$$

✓ Solution by Mathematica

Time used: 0.039 (sec). Leaf size: 17

```
DSolve[{t*Log[t]*y'[t]==t*Log[t]-y[t],y[Exp[1]]==1},y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to t + \frac{1-t}{\log(t)}$$

8.3 problem 1.2-3 (c)

Internal problem ID [1975]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.2-3, page 12
Problem number: 1.2-3 (c).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_linear]`

$$\boxed{y' - \frac{2y}{-t^2+1} - 3 = 0}$$

With initial conditions

$$\left[y\left(\frac{1}{2}\right) = 1\right]$$

✓ Solution by Maple

Time used: 0.047 (sec). Leaf size: 34

```
dsolve([diff(y(t),t)=2/(1-t^2)*y(t)+3,y(1/2) = 1],y(t), singsol=all)
```

$$y(t) = \frac{(t+1)\left(18t - 36\ln(t+1) - 11 + 36\ln(3) - 36\ln(2)\right)}{6t-6}$$

✓ Solution by Mathematica

Time used: 0.04 (sec). Leaf size: 34

```
DSolve[{y'[t]==2/(1-t^2)*y[t]+3,y[1/2]==1},y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to \frac{(t+1)\left(18t - 36\log(t+1) - 11 + 36\log\left(\frac{3}{2}\right)\right)}{6(t-1)}$$

8.4 problem 1.2-3 (d)

Internal problem ID [1976]

Book: Ordinary Differential Equations, Robert H. Martin, 1983
Section: Problem 1.2-3, page 12
Problem number: 1.2-3 (d).
ODE order: 1.
ODE degree: 1.

CAS Maple gives this as type `[_linear]`

$$\boxed{y' + \cot(t)\, y - 6\cos(t)^2 = 0}$$

With initial conditions

$$\left[y\left(\frac{\pi}{4}\right) = 3\right]$$

✓ Solution by Maple

Time used: 0.047 (sec). Leaf size: 18

```
dsolve([diff(y(t),t)=-cot(t)*y(t)+6*cos(t)^2,y(1/4*Pi) = 3],y(t), singsol=all)
```

$$y(t) = -2\csc(t)\left(\cos(t)^3 - \sqrt{2}\right)$$

✓ Solution by Mathematica

Time used: 0.056 (sec). Leaf size: 23

```
DSolve[{y'[t]==-Cot[t]*y[t]+6*Cos[t]^2,y[Pi/4]==3},y[t],t,IncludeSingularSolutions -> True]
```

$$y(t) \to 2\sqrt{2}\csc(t) - 2\cos^2(t)\cot(t)$$