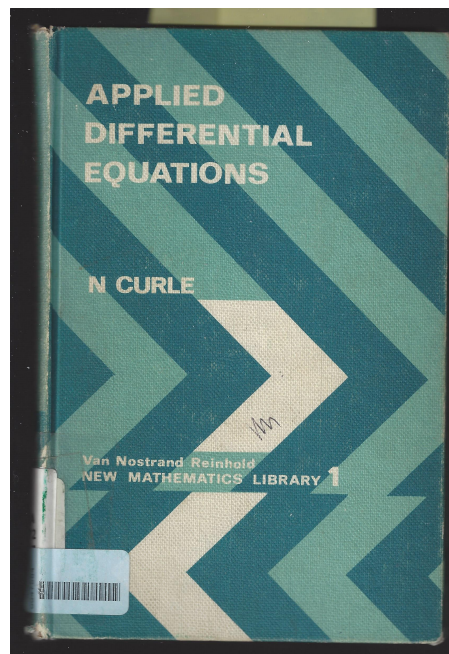


A Solution Manual For

# Applied Differential equations, N Curle, 1971



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# 1 Examples, page 35

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## 1.1 problem 1

Internal problem ID [2998]

**Book:** Applied Differential equations, N Curle, 1971

**Section:** Examples, page 35

**Problem number:** 1.

**ODE order:** 1.

**ODE degree:** 2.

CAS Maple gives this as type [\_quadrature]

$$y - y' - \frac{y'^2}{2} = 0$$

### ✓ Solution by Maple

Time used: 0.031 (sec). Leaf size: 145

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

$$y(x) = \frac{e^{-2 \operatorname{LambertW}(-\sqrt{2}e^{-c_1+x-1})-2c_1+2x+\ln(2)-2}}{2} - e^{-\operatorname{LambertW}(-e^{-c_1}e^x\sqrt{2}e^{-1})-c_1+x+\frac{\ln(2)}{2}-1}$$

$$y(x) = \frac{e^{2 \operatorname{RootOf}(-_Z-2x+2e^{-Z}-2+2c_1+\ln(\frac{e^{3Z}}{2}-2e^{2-Z}+2e^{-Z}))}}{2} - e^{\operatorname{RootOf}(-_Z-2x+2e^{-Z}-2+2c_1+\ln(\frac{e^{3Z}}{2}-2e^{2-Z}+2e^{-Z}))}$$

### ✓ Solution by Mathematica

Time used: 18.04 (sec). Leaf size: 66

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

$$y(x) \rightarrow \frac{1}{2}W(-e^{x-1-c_1}) (2 + W(-e^{x-1-c_1}))$$

$$y(x) \rightarrow \frac{1}{2}W(e^{x-1+c_1}) (2 + W(e^{x-1+c_1}))$$

$$y(x) \rightarrow 0$$

## 1.2 problem 2

Internal problem ID [2999]

**Book:** Applied Differential equations, N Curle, 1971

**Section:** Examples, page 35

**Problem number:** 2.

**ODE order:** 1.

**ODE degree:** 2.

CAS Maple gives this as type `[_1st_order, _with_linear_symmetries], _rational, _Clairaut]`

$$(-xy' + y)^2 - y'^2 = 1$$

### ✓ Solution by Maple

Time used: 0.078 (sec). Leaf size: 57

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

$$y(x) = \sqrt{-x^2 + 1}$$

$$y(x) = -\sqrt{-x^2 + 1}$$

$$y(x) = c_1x - \sqrt{c_1^2 + 1}$$

$$y(x) = c_1x + \sqrt{c_1^2 + 1}$$

### ✓ Solution by Mathematica

Time used: 0.127 (sec). Leaf size: 73

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

$$y(x) \rightarrow c_1x - \sqrt{1 + c_1^2}$$

$$y(x) \rightarrow c_1x + \sqrt{1 + c_1^2}$$

$$y(x) \rightarrow -\sqrt{1 - x^2}$$

$$y(x) \rightarrow \sqrt{1 - x^2}$$

### 1.3 problem 3

Internal problem ID [3000]

**Book:** Applied Differential equations, N Curle, 1971

**Section:** Examples, page 35

**Problem number:** 3.

**ODE order:** 1.

**ODE degree:** 3.

CAS Maple gives this as type `[[_homogeneous, 'class C'], _dAlembert]`

$$y - y'^2 \left(1 - \frac{2y'}{3}\right) = x$$

#### ✓ Solution by Maple

Time used: 0.031 (sec). Leaf size: 35

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

$$y(x) = x + \frac{1}{3}$$

$$y(x) = c_1 - \frac{2(c_1 - x)^{\frac{3}{2}}}{3}$$

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

#### ✗ Solution by Mathematica

Time used: 0.0 (sec). Leaf size: 0

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

Timed out

## 1.4 problem 4

Internal problem ID [3001]

**Book:** Applied Differential equations, N Curle, 1971

**Section:** Examples, page 35

**Problem number:** 4.

**ODE order:** 1.

**ODE degree:** 1.

CAS Maple gives this as type `[_homogeneous, 'class C', _rational, _Riccati]`

$$y'x^2 - x(y - 1) - (y - 1)^2 = 0$$

### ✓ Solution by Maple

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

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

$$y(x) = 1 - \frac{x}{\ln(x) + c_1}$$

### ✓ Solution by Mathematica

Time used: 0.203 (sec). Leaf size: 23

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

$$y(x) \rightarrow 1 + \frac{x}{-\log(x) + c_1}$$

$$y(x) \rightarrow 1$$