In[29]:=
```
D[Integrate[1 / (x^3 + 1), x], x]
Simplify[%]
```

Out[29]= $\frac{1}{3\left(1+x\right)} - \frac{-1+2x}{6\left(1-x+x^2\right)} + \frac{2}{3\left(1+\frac{1}{3}\left(-1+2x\right)^2\right)}$

Out[30]= $\frac{1}{1+x^3}$

In[31]:=
```
Simplify[Sqrt[x^2]]
```

Out[31]= $\sqrt{x^2}$

In[32]:=
```
Simplify[Sqrt[x^2], x > 0]
```

Out[32]= x

In[33]:=
```
Simplify[Sqrt[x^2], Element[x, Reals]]
```

Out[33]= $\text{Abs}\left[x\right]$

In[34]:=
```
Cos[k Pi]
```

Out[34]= $\text{Cos}\left[k\,\pi\right]$

In[35]:=
```
Simplify[Cos[k Pi], Element[k, Integers]]
```

Out[35]= $\left(-1\right)^k$

In[44]:=
```
Clear[F]
F = 2 a + 2 Sqrt[a - Sqrt[-b]] Sqrt[a + Sqrt[-b]]
```

Out[45]= $2\,a + 2\sqrt{a-\sqrt{-b}}\ \sqrt{a+\sqrt{-b}}$

In[46]:=
```
Simplify[F, a > 0 && b > 0]
```

Out[46]= $2\left(a+\sqrt{a^2+b}\right)$

In[47]:=
```
Simplify[F, {a > 0, b > 0}]
```

Out[47]= $2\left(a+\sqrt{a^2+b}\right)$

In[48]:=
```
Simplify[F, Assumptions → {a > 0, b > 0}]
```

Out[48]= $2\left(a+\sqrt{a^2+b}\right)$

In[49]:=
```
Solve[x^2 + a x + 1 == 0, x]
```

Out[49]= $\left\{\left\{x \to \frac{1}{2}\left(-a-\sqrt{-4+a^2}\right)\right\}, \left\{x \to \frac{1}{2}\left(-a+\sqrt{-4+a^2}\right)\right\}\right\}$

In[50]:=
```
Solve[x^2 + 2 y^3 == 3681 && x > 0 && y > 0, {x, y}, Integers]
```

Out[50]= $\left\{\left\{x \to 15,\ y \to 12\right\}, \left\{x \to 41,\ y \to 10\right\}, \left\{x \to 57,\ y \to 6\right\}\right\}$

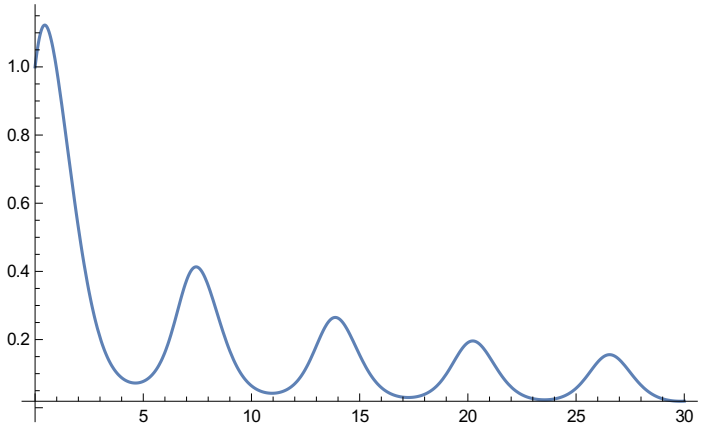
In[52]:=
```
Solve[{x + y == 1, 2 x + y == 3}, {x, y}]
```
Out[52]=
$$\{\{x \to 2,\ y \to -1\}\}$$

In[53]:=
```
DSolve[y'[x] + y[x] == a Sin[x], y[x], x]
```
Out[53]=
$$\left\{\left\{y[x] \to e^{-x}\, C[1] + \frac{1}{2} a \left(-\text{Cos}[x] + \text{Sin}[x]\right)\right\}\right\}$$

In[54]:=
```
DSolve[{y'[x] + y[x] == a Sin[x], y[0] == 0}, y[x], x]
```
Out[54]=
$$\left\{\left\{y[x] \to -\frac{1}{2} a\, e^{-x} \left(-1 + e^{x} \text{Cos}[x] - e^{x} \text{Sin}[x]\right)\right\}\right\}$$

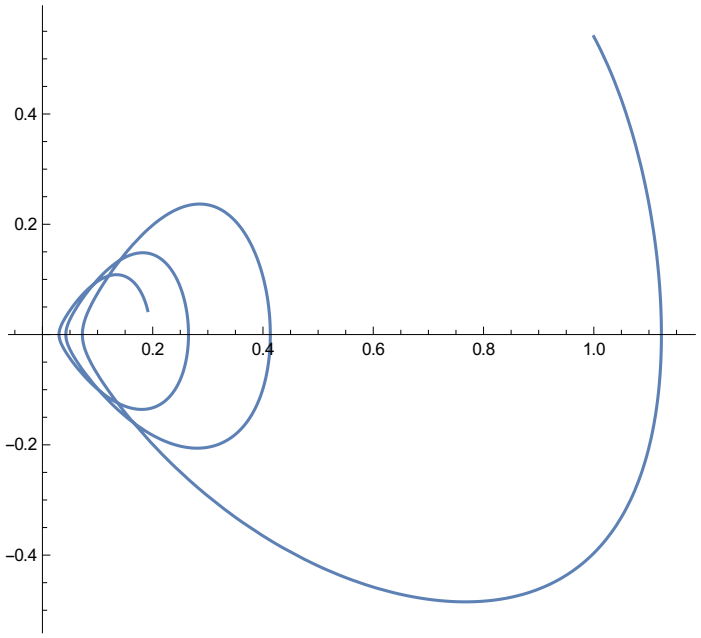
In[56]:=
```
s = NDSolve[{y'[x] == y[x] Cos[x + y[x]], y[0] == 1}, y, {x, 0, 30}]
```
Out[56]=
$$\{\{y \to \text{InterpolatingFunction}[\ \langle\text{Domain: } \{\{0., 30.\}\}\ \text{Output: scalar}\rangle\ ]\}\}$$

In[57]:=
```
Plot[Evaluate[y[x] /. s], {x, 0, 30}, PlotRange → All]
```
Out[57]=



In[58]:=
```
ParametricPlot[Evaluate[{y[x], y'[x]} /. s], {x, 0, 20}]
```

Out[58]=



In[59]:=
```
s = NDSolve[{y''[x] + Sin[y[x]] y[x] == 0, y[0] == 1, y'[0] == 0}, y, {x, 0, 30}]
Plot[Evaluate[{y[x], y'[x], y''[x]} /. s], {x, 0, 30}, PlotStyle -> Automatic]
```

Out[59]=
```
{{y → InterpolatingFunction[ ]}}
```
Domain: {{0., 30.}}
Output: scalar

Out[60]=