W6-P1a

```
DSolve[y'[x] == 3 x^2 / y[x], y[x], x]
```

$$\{\{y[x] \to -\sqrt{2}\ \sqrt{x^3 + C[1]}\ \}, \{y[x] \to \sqrt{2}\ \sqrt{x^3 + C[1]}\ \}\}$$

W6-P1b

```
DSolve[y'[x] == 4 x (y[x])^2, y[x], x]
```

$$\left\{\left\{y[x] \to \frac{1}{-2\,x^2 - C[1]}\right\}\right\}$$

W6-P1c

In[2]:=
```
DSolve[x'[t] == 2 (x[t] + 1) t, x[t], t]
```

Out[2]=
$$\{\{x[t] \to -1 + e^{t^2}\, C[1]\}\}$$

W6-P2a

```
DSolve[{y'[x] == (y[x] + 1) / (x - 3), y[0] == 1}, y[x], x]
```

$$\left\{\left\{y[x] \to \frac{1}{3}\,(3 - 2\,x)\right\}\right\}$$

W6-P2b

In[4]:=
```
DSolve[{y'[x] == (x^2 - 1) / (2 y[x] + 1), y[0] == -1}, y[x], x]
```

DSolve: For some branches of the general solution, the given boundary conditions lead to an empty solution.

Out[4]=
$$\left\{\left\{y[x] \to \frac{1}{6}\left(-3 - \sqrt{3}\ \sqrt{3 - 12\,x + 4\,x^3}\right)\right\}\right\}$$

W6-P3

```
Solve[A0/2 == A0 Exp[-k t], t, Reals]
```

$$\left\{\left\{t \to \frac{\text{Log}[2]}{k}\right\}\right\}$$

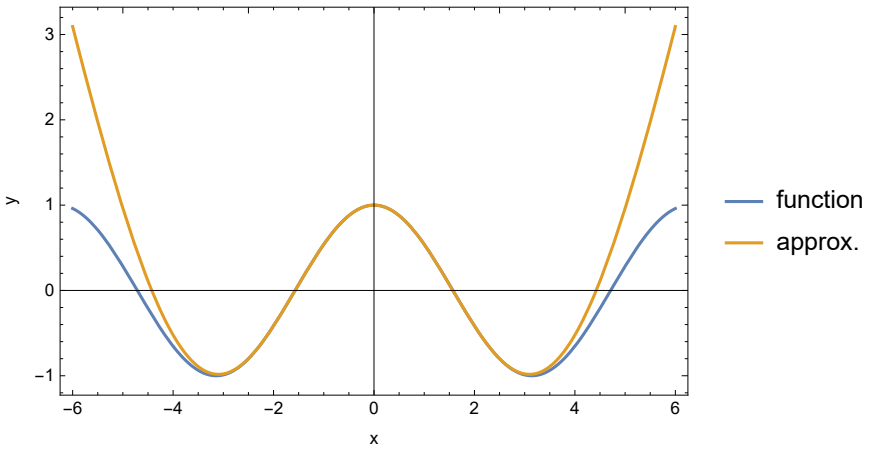
W6-P4

In[5]:=
```
A[x_] = PadeApproximant[Cos[x], {x, 0, 5}]
```

Out[5]=
$$\frac{1 - \frac{115\,x^2}{252} + \frac{313\,x^4}{15\,120}}{1 + \frac{11\,x^2}{252} + \frac{13\,x^4}{15\,120}}$$

In[7]:=
```
Plot[{Cos[x], A[x]}, {x, -6, 6},
 PlotLegends → {"function", "approx."}, Frame → True, FrameLabel → {"x", "y"}]
```

Out[7]=



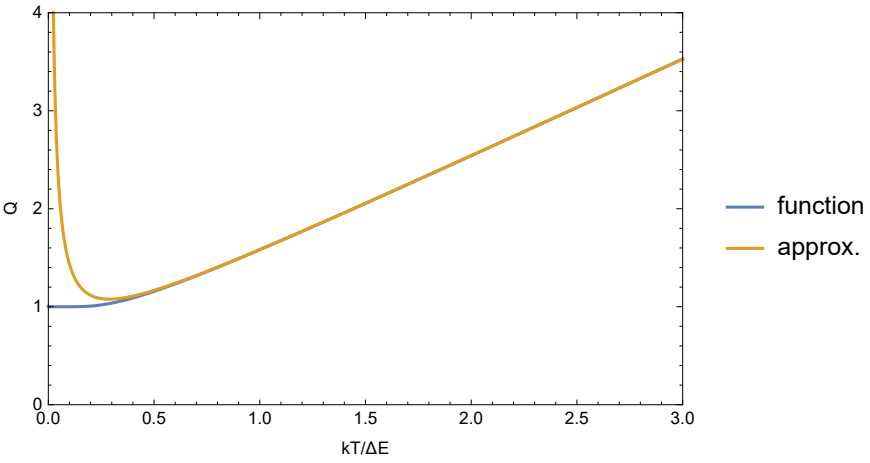

```
Limit[A[x], x → ∞]
```

$$\frac{313}{13}$$

W6-P5

In[8]:=
```
Plot[{1 / (1 - Exp[-1 / x]), x + 1/2 + 1/(12 x)}, {x, 0, 3}, PlotRange → {{0, 3}, {0, 4}},
 PlotLegends → {"function", "approx."}, Frame → True, FrameLabel → {"kT/ΔE", "Q"}]
```

Out[8]=



W6-P6

```
$Assumptions = a ∈ Reals && b ∈ Reals && c ∈ Reals;
y'[x] == f[a x + b y[x] + c] /. {y[x] → (u[x] - a x)/b}
```

$$y'[x] == f[c + u[x]]$$