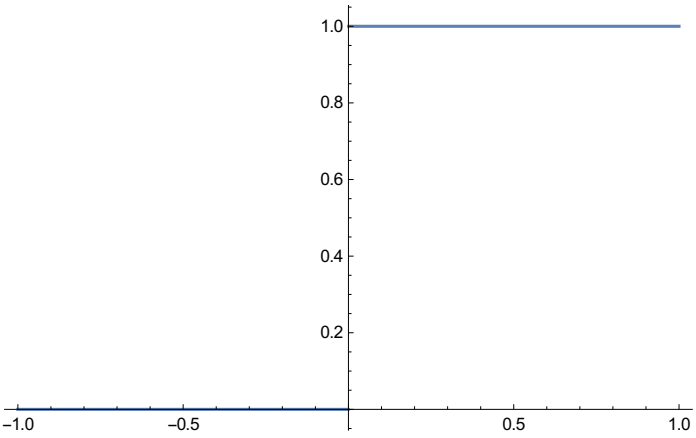
# An oscillator with a switch in forcing

In[3]:=
```
Plot[HeavisideTheta[t], {t, -1, 1}]
```

Out[3]=




x'' + x' + 3 x = - H(t - 3) cos(2t)
x(0) = 0
x'(0) = 1

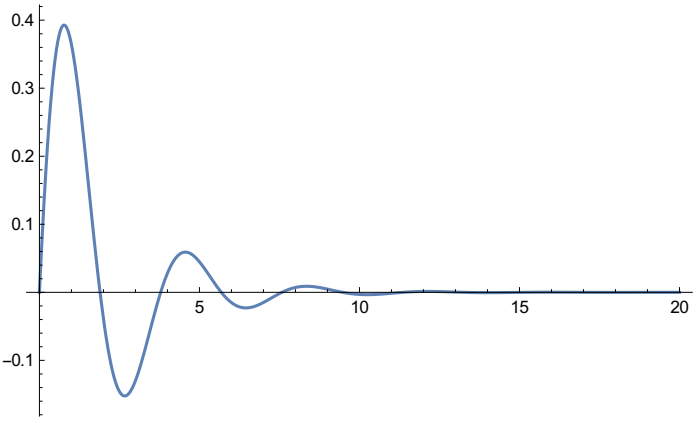
In[4]:=
```
xh[t_] = 2 E^(-t / 2) Sin[Sqrt[11] t / 2] / Sqrt[11]
```

Out[4]=

$$\frac{2\, e^{-t/2}\, \text{Sin}\left[\frac{\sqrt{11}\, t}{2}\right]}{\sqrt{11}}$$

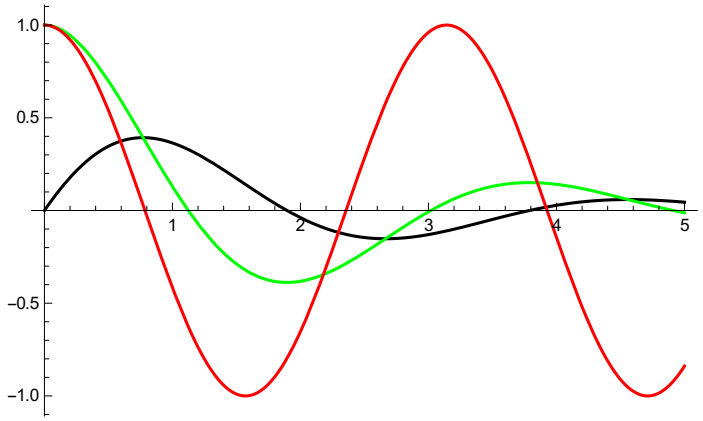
In[5]:=
```
Plot[xh[t], {t, 0, 20}, PlotRange → All]
```

Out[5]=



In[6]:=
```
Plot[{xh[t], xh'[t] + xh[t], Cos[2 t]}, {t, 0, 5},
 PlotRange → All, PlotStyle → {Black, Green, Red}]
```

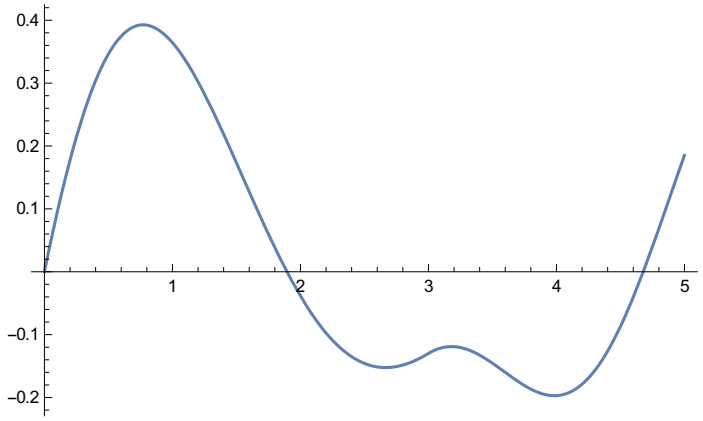
Out[6]=




In[12]:=
```
x[t_] = xh[t] -
    HeavisideTheta[t - 3] (E^((3 - t) / 2) ( (Cos[6] - 2 Sin[6]) Cos[Sqrt[11] (t - 3) / 2] -
          (7 Cos[6] + 6 Sin[6]) Sin[Sqrt[11] (t - 3) / 2] / Sqrt[11] ) -
       (Cos[6] - 2 Sin[6]) Cos[2 (t - 3)] + (2 Cos[6] + Sin[6]) Sin[2 (t - 3)]) / 5;
```

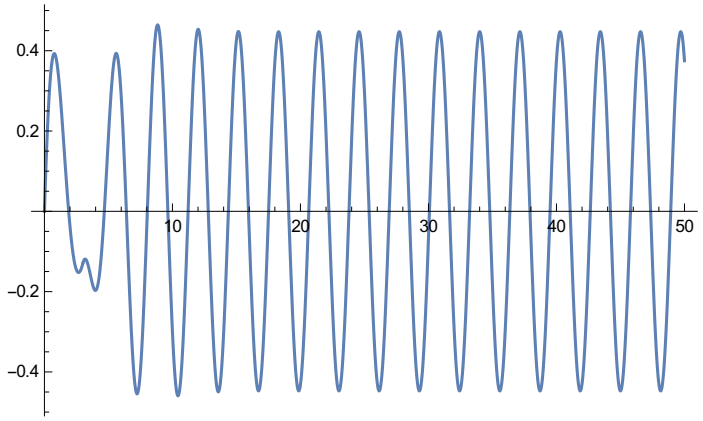
In[13]:=
```
Plot[x[t], {t, 0, 5}]
```

Out[13]=




In[14]:=
```
Plot[x[t], {t, 0, 50}]
```

Out[14]=



In[10]:=
```
Plot[{x[t], HeavisideTheta[t - 10] Cos[2 t]},
 {t, 9.5, 10.5}, PlotStyle → {Black, Red}, PlotRange → All]
```

Out[10]=