Out[146]= $k\,x[t] + \gamma\,x'[t] + m\,x''[t] == e^{i\,t\,\omega}$

In[215]:=
```
ClearAll[m, x, γ, k, driven, p, ω, t_]
driven = m x''[t] + γ x'[t] + k x[t] == E^(I ω t)
solution = DSolve[{driven, x'[0] == 0, x[0] == 0}, x[t], t]
f[x_] = x[t] /. solution[[1]]
```

Out[216]= $k\,x[t] + \gamma\,x'[t] + m\,x''[t] == e^{i\,t\,\omega}$

Out[217]=
$$\left\{\left\{x[t] \to -\left(2\,m\left(e^{\frac{t\left(-\gamma-\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}}\,\gamma - e^{\frac{t\left(-\gamma+\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}}\,\gamma + e^{\frac{t\left(-\gamma+\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}+\frac{t\left(\gamma-\sqrt{-4\,k\,m+\gamma^2}+2\,i\,m\,\omega\right)}{2\,m}}\,\gamma - e^{\frac{t\left(-\gamma-\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}+\frac{t\left(\gamma+\sqrt{-4\,k\,m+\gamma^2}+2\,i\,m\,\omega\right)}{2\,m}}\,\gamma - e^{\frac{t\left(-\gamma-\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}}\sqrt{-4\,k\,m+\gamma^2} - e^{\frac{t\left(-\gamma+\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}}\sqrt{-4\,k\,m+\gamma^2} + e^{\frac{t\left(-\gamma+\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}+\frac{t\left(\gamma-\sqrt{-4\,k\,m+\gamma^2}+2\,i\,m\,\omega\right)}{2\,m}}\sqrt{-4\,k\,m+\gamma^2} + e^{\frac{t\left(-\gamma-\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}+\frac{t\left(\gamma+\sqrt{-4\,k\,m+\gamma^2}+2\,i\,m\,\omega\right)}{2\,m}}\sqrt{-4\,k\,m+\gamma^2} + 2\,i\,e^{\frac{t\left(-\gamma-\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}}\,m\,\omega - 2\,i\,e^{\frac{t\left(-\gamma+\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}}\,m\,\omega + 2\,i\,e^{\frac{t\left(-\gamma+\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}+\frac{t\left(\gamma-\sqrt{-4\,k\,m+\gamma^2}+2\,i\,m\,\omega\right)}{2\,m}}\,m\,\omega - 2\,i\,e^{\frac{t\left(-\gamma-\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}+\frac{t\left(\gamma+\sqrt{-4\,k\,m+\gamma^2}+2\,i\,m\,\omega\right)}{2\,m}}\,m\,\omega\right)\right) \Big/ \left(\sqrt{-4\,k\,m+\gamma^2}\left(-\gamma+\sqrt{-4\,k\,m+\gamma^2}-2\,i\,m\,\omega\right)\left(\gamma+\sqrt{-4\,k\,m+\gamma^2}+2\,i\,m\,\omega\right)\right)\right\}\right\}$$

Out[218]=
$$-\left(2\,m\left(e^{\frac{t\left(-\gamma-\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}}\,\gamma - e^{\frac{t\left(-\gamma+\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}}\,\gamma + e^{\frac{t\left(-\gamma+\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}+\frac{t\left(\gamma-\sqrt{-4\,k\,m+\gamma^2}+2\,i\,m\,\omega\right)}{2\,m}}\,\gamma - e^{\frac{t\left(-\gamma-\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}+\frac{t\left(\gamma+\sqrt{-4\,k\,m+\gamma^2}+2\,i\,m\,\omega\right)}{2\,m}}\,\gamma - e^{\frac{t\left(-\gamma-\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}}\sqrt{-4\,k\,m+\gamma^2} - e^{\frac{t\left(-\gamma+\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}}\sqrt{-4\,k\,m+\gamma^2} + e^{\frac{t\left(-\gamma+\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}+\frac{t\left(\gamma-\sqrt{-4\,k\,m+\gamma^2}+2\,i\,m\,\omega\right)}{2\,m}}\sqrt{-4\,k\,m+\gamma^2} + e^{\frac{t\left(-\gamma-\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}+\frac{t\left(\gamma+\sqrt{-4\,k\,m+\gamma^2}+2\,i\,m\,\omega\right)}{2\,m}}\sqrt{-4\,k\,m+\gamma^2} + 2\,i\,e^{\frac{t\left(-\gamma-\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}}\,m\,\omega - 2\,i\,e^{\frac{t\left(-\gamma+\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}}\,m\,\omega + 2\,i\,e^{\frac{t\left(-\gamma+\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}+\frac{t\left(\gamma-\sqrt{-4\,k\,m+\gamma^2}+2\,i\,m\,\omega\right)}{2\,m}}\,m\,\omega - 2\,i\,e^{\frac{t\left(-\gamma-\sqrt{-4\,k\,m+\gamma^2}\right)}{2\,m}+\frac{t\left(\gamma+\sqrt{-4\,k\,m+\gamma^2}+2\,i\,m\,\omega\right)}{2\,m}}\,m\,\omega\right)\right) \Big/ \left(\sqrt{-4\,k\,m+\gamma^2}\left(-\gamma+\sqrt{-4\,k\,m+\gamma^2}-2\,i\,m\,\omega\right)\left(\gamma+\sqrt{-4\,k\,m+\gamma^2}+2\,i\,m\,\omega\right)\right)$$

In[163]:=
```
m = k = 1
γ = .5
ω = 1 π
Plot[Re[f[t]], {t, 0, 50}]
```

Out[163]= 1

Out[164]= 0.5

Out[165]= π

Out[166]=