

# Physics 238

## Damped Oscillations

```
In[70]:= Clear["Global`*"]
```

```
In[71]:= x[t_, γ_] := B Exp[p[γ] t]
```

```
In[72]:= p[γ_] := (-γ/2) + Sqrt[γ2/4 - ω02]
```

```
In[73]:= ω0 = 1.0; (* For convenience in plotting *)
```

Initial Conditions -- set B = 10.0.

```
In[74]:= B = 10.0;
```

```
In[75]:= x[t, γ]
```

```
Out[75]=
```

$$10. e^{t \left( -\frac{\gamma}{2} + \sqrt{-1. + \frac{\gamma^2}{4}} \right)}$$

```
In[76]:= x[t, 0.2]
```

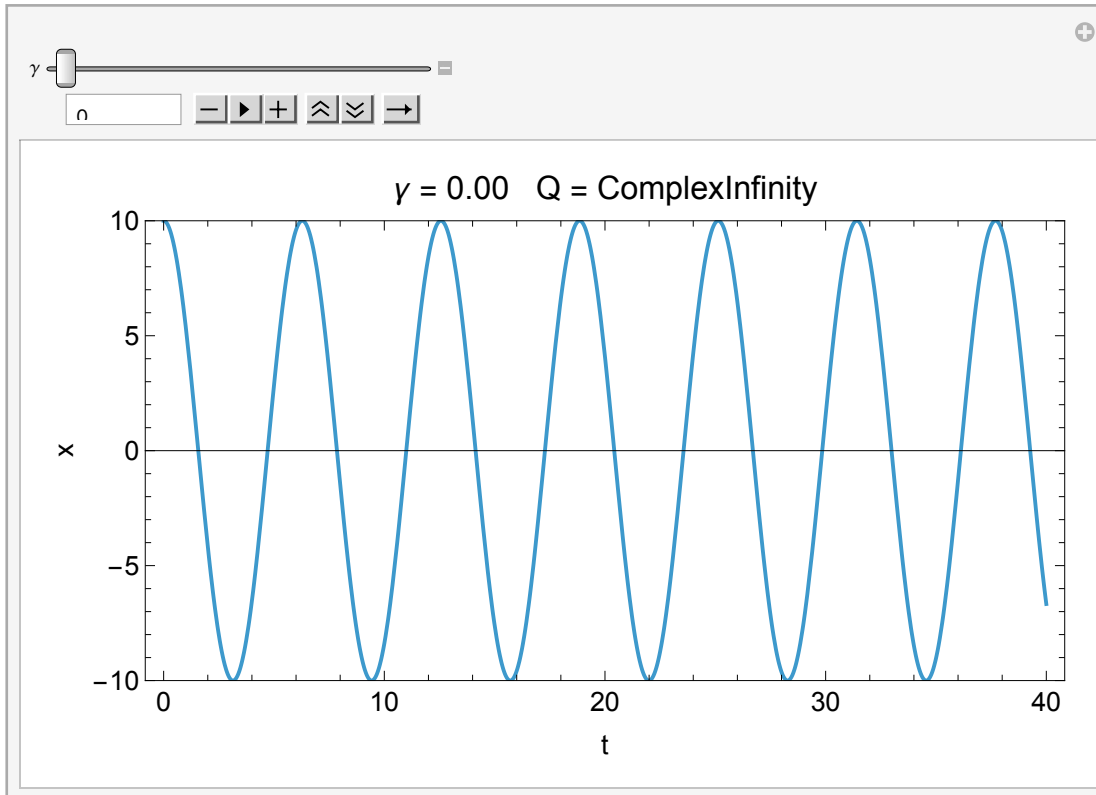
```
Out[76]=
```

$$10. e^{(-0.1 + 0.994987 i) t}$$

```
In[78]:= smartlabel[γ_] := StringForm["γ = `` Q = ``",  
    NumberForm[γ, {3, 2}], NumberForm[ω0/γ, {4, 3}]] // Quiet
```

```
In[79]:= Manipulate[Plot[Re[x[t,  $\gamma$ ]], {t, 0, 40}, PlotRange  $\rightarrow$  {-10, 10},
  LabelStyle  $\rightarrow$  Larger, Frame  $\rightarrow$  True, PlotLabel  $\rightarrow$  smartLabel[ $\gamma$ ],
  FrameLabel  $\rightarrow$  {"t", "x"}, ImageSize  $\rightarrow$  Scaled[0.9], AspectRatio  $\rightarrow$  1/2],
  { $\gamma$ , 0, 4, 0.02, Appearance  $\rightarrow$  "Open"}]
```

Out[79]=



```
In[62]:= Plot[{Re[x[t, 0.5]], Re[x[t, 2.0]], Re[x[t, 8.0]]},
  {t, 0, 40}, PlotRange  $\rightarrow$  {-10, 10}, ImageSize  $\rightarrow$  Scaled[0.7],
  AspectRatio  $\rightarrow$  1/2, PlotStyle  $\rightarrow$  {Red, Green, Blue},
  PlotLegends  $\rightarrow$  {" $\gamma = 0.5$ ", " $\gamma = 2.0$ ", " $\gamma = 8.0$ "}, LabelStyle  $\rightarrow$  Larger]
```

Out[62]=

