Simple Harmonic Motion

$d = 4\sin(2t)$

4 units

$T = \frac{2\pi}{2} = \pi$ sec

$f = \frac{1}{T} = \frac{1}{\pi}$ Hz $= \frac{1}{\pi}$ /s

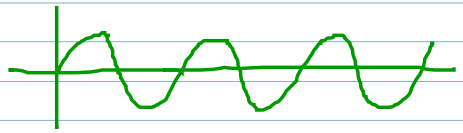
$a = 6$ $T = 5$ sec $b = \frac{2\pi}{T} = \frac{2\pi}{5}$

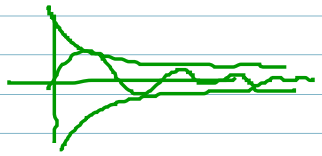
$d = -6\cos\left(\frac{2\pi}{5}t\right)$

$d = a\cos(\omega t)$ $f = 520$ Hz $= \frac{b}{2\pi}$ $b = f \cdot 2\pi = 1040\pi$ 0.80 mm

$d = 0.8\cos(1040\pi t)$

Damped Motion





$d(t) = ae^{\frac{-bt}{2m}}\cos\left(\sqrt{\omega^2 - \frac{b^2}{4m^2}}\,t\right)$

b = damping factor
m = mass of oscillating object
|a| = displacement at t = 0
$T = \frac{2\pi}{\omega}$

$y = e^{\frac{-bt}{2m}}, -e^{\frac{-bt}{2m}}$ bounding curves

$m = 20$ $b = 0.75$ $a = 15$ $T = 6$ $\omega = \frac{2\pi}{6} = \frac{\pi}{3} = \omega$

$d = 15e^{\frac{-0.75\pi}{40}}\cos\left(\sqrt{\left(\frac{\pi}{3}\right)^2 - \frac{\pi^2}{1600}}\,t\right)$

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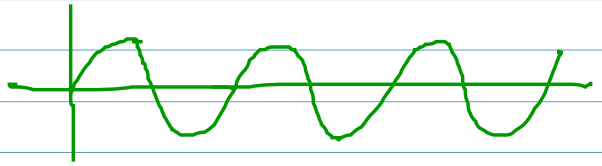
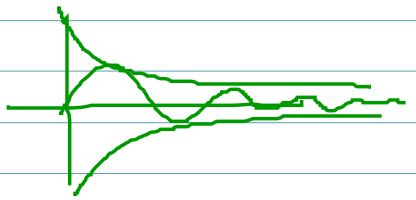
Damped Motion





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$a = 15$ $T = 6$ $\omega = \frac{2\pi}{6} = \frac{\pi}{3} = \omega$

$d = 15e^{\frac{-0.75t}{40}}\cos\left(\sqrt{\left(\frac{\pi^2}{9} - \frac{9}{1600}\right)}\,t\right)$