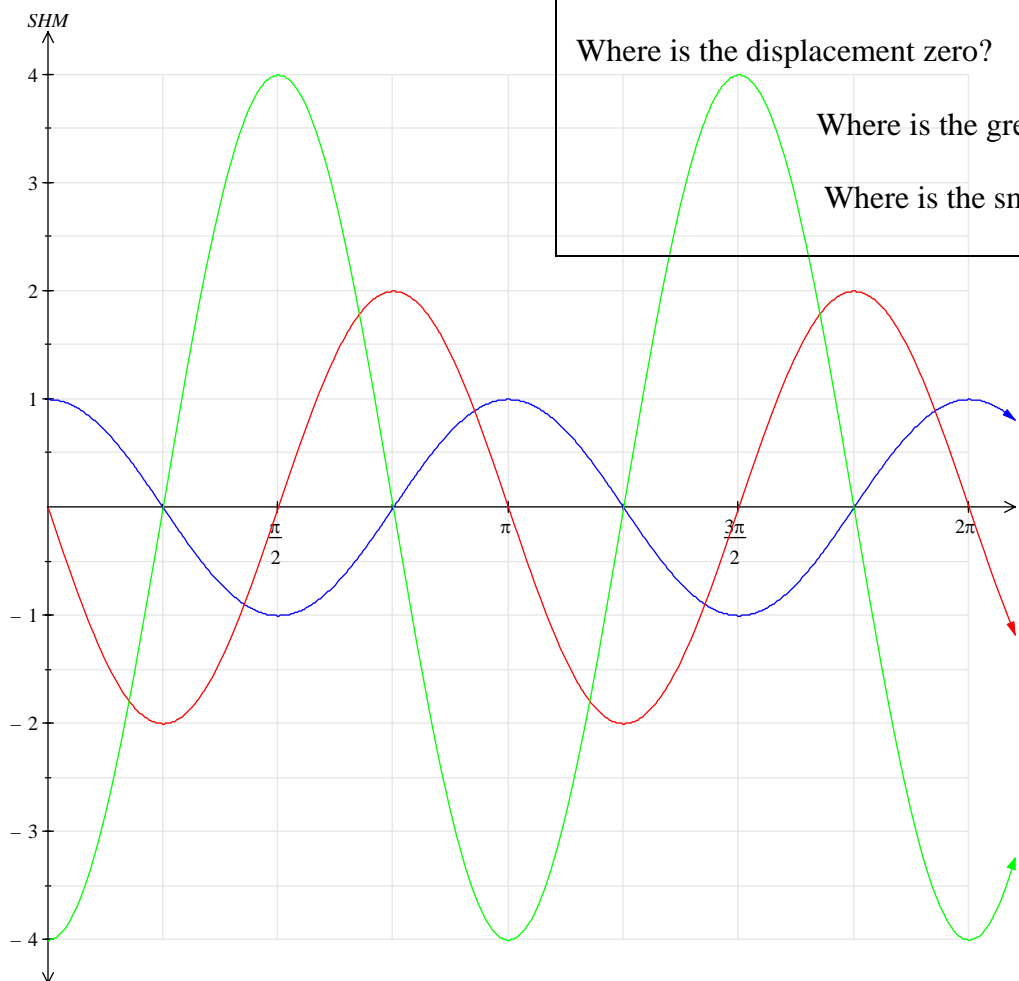


Simple Harmonic Motion

Displacement: $x = \cos 2t$
 Velocity: $\dot{x} = -2\sin 2t$
 Acceleration: $\ddot{x} = -4\cos 2t$



Where is the velocity equal to zero?

Where is the displacement maximum?

Where is the velocity maximum or minimum?

Where is the displacement zero?

Where is the greatest acceleration?

Where is the smallest acceleration?

Summary

- For a body moving with SHM about $x = 0$, $\ddot{x} = -n^2 x$
 - A solution to this equation is:
 $x = A\sin(nt + k)$ or $x = A\cos(nt + k)$ where k represents the *phase shift*, A represents the *Amplitude* and n is linked to the period.
 - If timing begins at the origin use: $x = A\sin nt$
 - If timing begins at maximum displacement use: $x = A\cos nt$
 - SHM is periodic with Period T , where: $T = \frac{2\pi}{n}$
 - The amplitude is: $|A|$
 - The velocity v or \dot{x} at time t can be $\dot{x} = A n \cos(nt + k)$ or $\dot{x} = -A n \sin(nt + k)$
- It follows that: $\dot{x}^2 = n^2(A^2 - x^2)$ and $\dot{x}_{max} = |nA|$
- $\ddot{x}_{max} = |n^2 A|$