Waves

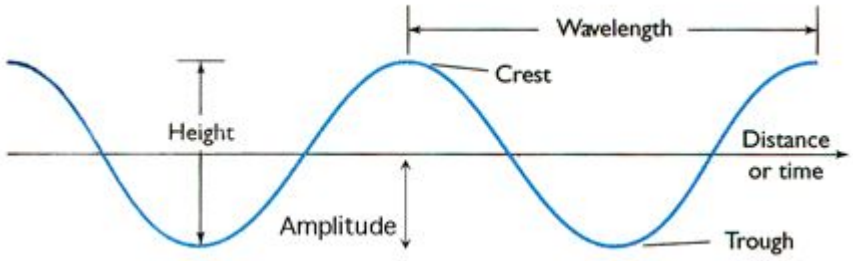
Tigran A, Lyndon F, Lucian I, Amy K, Jeremy K, ,Saro T

Wave Formulas

$V = f\lambda$ - Velocity = frequency (wavelength)

$f = 1/T$ - Frequency = 1/Time

$\omega = 2\pi(f)$ - Angular Frequency= 2π (Frequency)



Formulas

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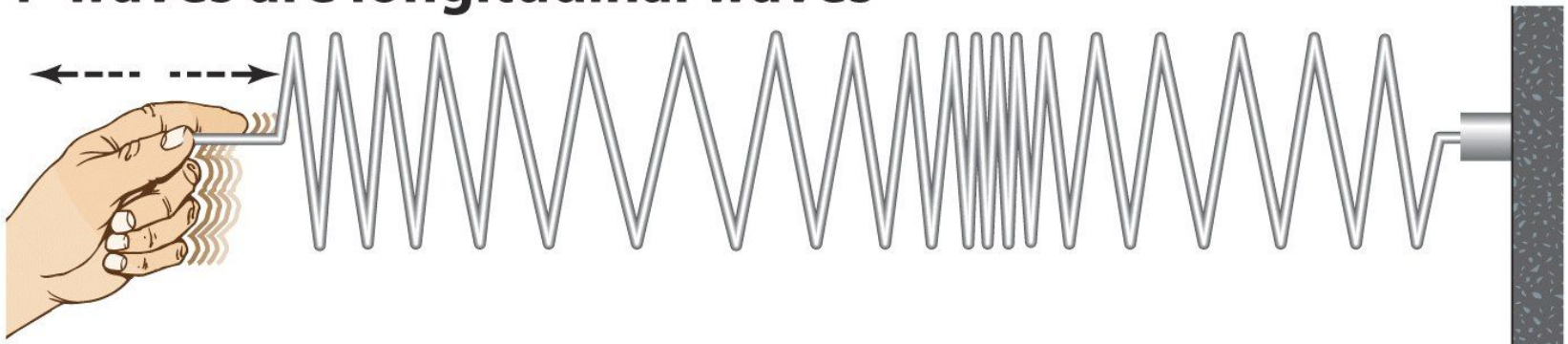
$f=\omega/2\pi=(1/2\pi)\sqrt{(k/m)}$ frequency = angular frequency /2π = ½π√mass*spring constant k

$T=2\pi/\omega=2\pi\sqrt{(m/k)}$ period =2π/ angular frequency

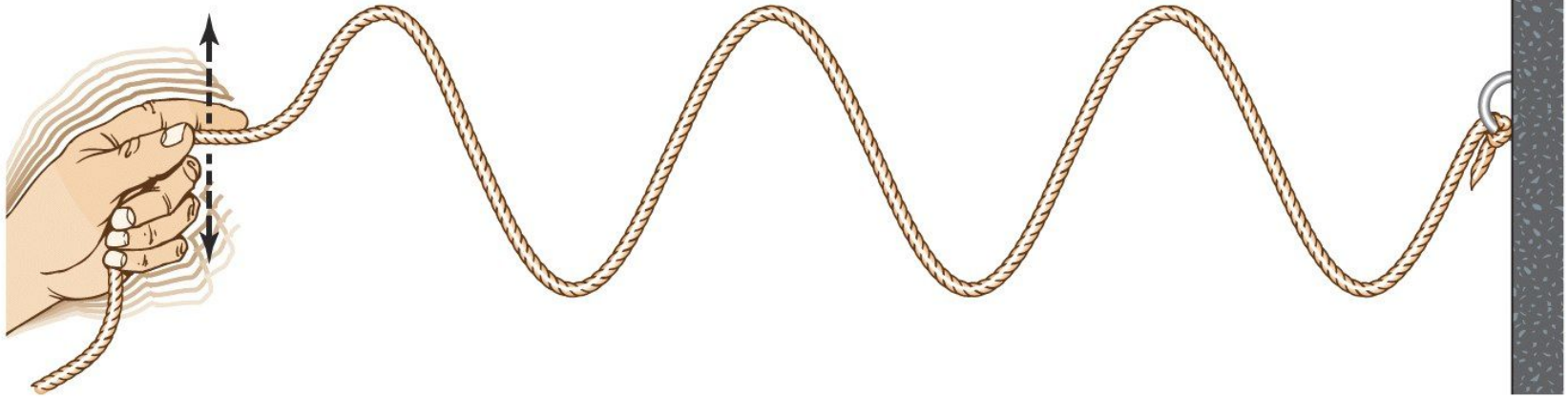
$T=2\pi\sqrt{(L/g)}$ Period = 2π√length*acceleration due to gravity

$x(t)=A\cos(\omega t)$ x(time) = area cos (angular frequency*time)

P waves are longitudinal waves



S waves are transverse waves



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Interference

Interference is the superposition of 2 or more waves resulting in a new wave pattern of increased, decreased, or neutralized amp.

- Constructive: when crest overlaps another crest the effects add up together
- Destructive: when crest meets trough the effects decrease.

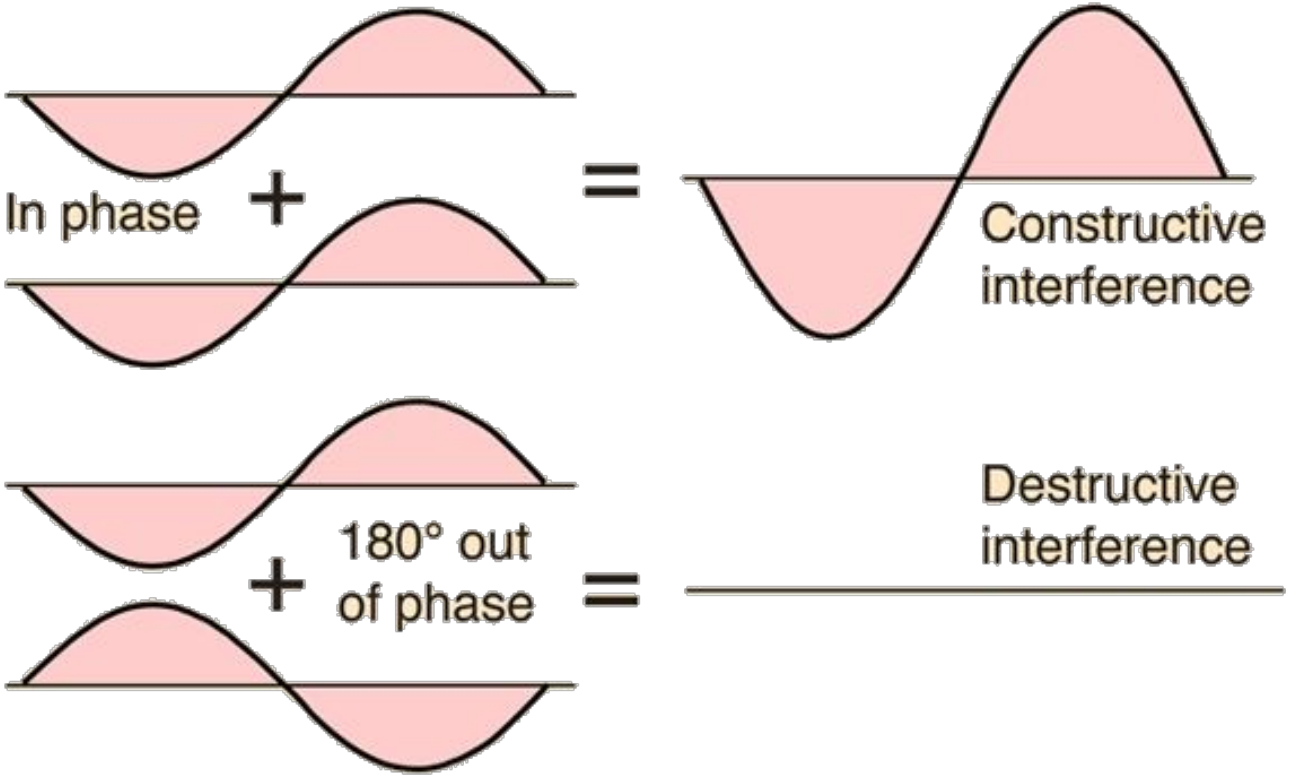
Phases

Phase is the relationship between the period of the wave and an external reference point. Correlates with interference

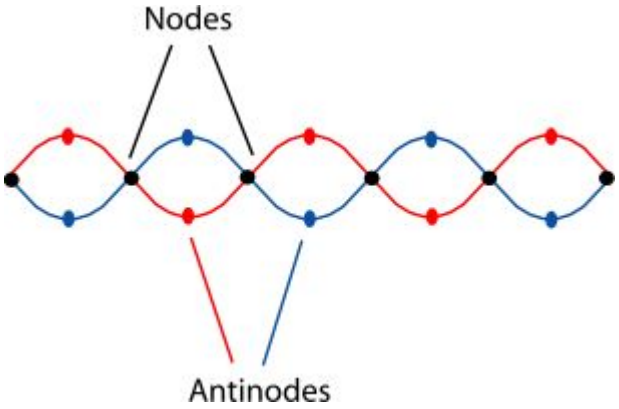
- In phase: two waves are in sync
- Out of phase: two waves are out of sync

Sin and Cos waves have a phase difference of 90 degrees or □/2

Phases 2


In phase
+
=
Constructive
interference
+
180° out
of phase
=
Destructive
interference

Standing Waves



Standing waves (stationary wave) have points that are “stationary” or fixed

Nodes: the fixed points

Antinodes: position on the wave with the biggest amplitudes, occurs halfway between the nodes

Standing Waves Cont.

- They are the result of interference
- Waves are out of phase at nodes
- Nodes are the stable regions of destructive interference

Misconceptions

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1) A wave transfers **energy**, Not matter, from a vibrating source
   - Think about sound waves, you don't see matter travel in the air

2) A vibration is a wiggle in time, a wave is a wiggle in time And space

3) Waves vary in frequency, amplitude, etc, depending on the densities of the things they are traveling through

Misconceptions continued

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4)An interference is when two waves meet, and the waves are simply added together

5)Constructive interference is when the waves build on each other, but destructive interference is when they cancel each other out

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