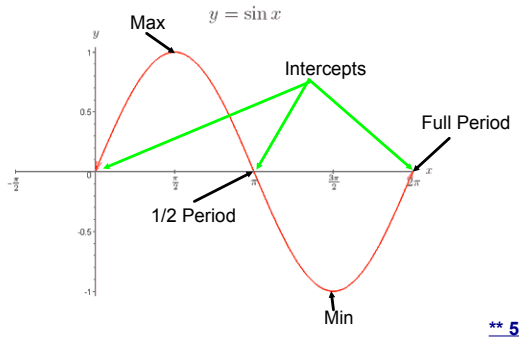
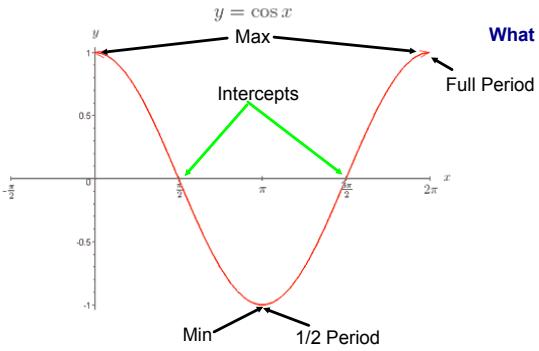
4.5 Graphs of Sine & Consine Functions Day 1

I. Graph:(from 0 to 2π)



**** 5 Key Points:**
Intercepts,Maximum & Minimum points

What is a Period?



II. Amplitude & Period of Sine and Cosine

Amplitude: y = asinx or y = acosx
- The amplitude represents half the distance between the max and min values of the function and is given by Amplitude = |a|.

Period: y = asinbx or y = acosbx

$$\text{Period} = \frac{2\pi}{|b|}$$

Ex1) Find the Amplitude and Period

a) y= 2cos3x

amp. $= |2| = 2$

Period $= \frac{2\pi}{|3|} = \frac{2\pi}{3}$

b) y = $-\frac{5}{2}\sin\frac{x}{2}$ → $\sin\frac{1}{2}x$

amp. $= \left|-\frac{5}{2}\right| = \frac{5}{2}$

Period $= \frac{2\pi}{\left|\frac{1}{2}\right|} \cdot 2 = 4\pi$

III. Translations: $y = a\sin(bx-c)$ and $y = a\cos(bx-c)$

$y = a\sin\left(b\left(x - \frac{c}{b}\right)\right)$ and $y = a\cos\left(b\left(x - \frac{c}{b}\right)\right)$

Phase shift or Horizontal shift

Ex2) State the Amplitude, Period & Phase shift of $y = 3 - \frac{1}{2}\sin\left(\frac{x}{2} + \pi\right)$

$\sin\left(\frac{1}{2}(x+2\pi)\right)$

amp. $= \left|-\frac{1}{2}\right| = \frac{1}{2}$

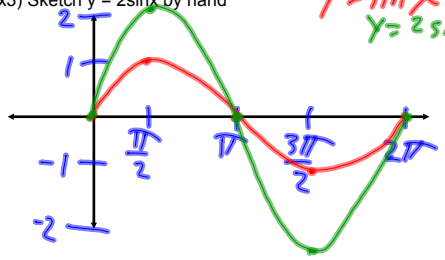
Period $= \frac{2\pi}{\left|\frac{1}{2}\right|} = 4\pi$

Phase shift: 2π units to the left

-: reflection over x-axis

3: vertical shift 3 units up

Ex3) Sketch $y = 2\sin x$ by hand



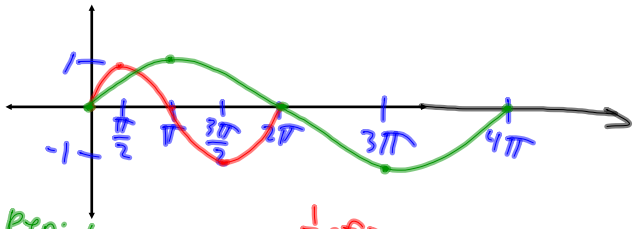
$y = \sin x$

$y = 2\sin x$

amp. = 2

2 is $\frac{1}{2}$ the distance from max. to min.

Ex4) Sketch $y = \sin\frac{x}{2}$ by hand



$y = \sin x$

$y = \sin\frac{1}{2}x$

Period $= \frac{2\pi}{\left|\frac{1}{2}\right|} = 4\pi$

$\frac{1}{4}$ of $2\pi = \frac{\pi}{2}$ → max.

$\frac{1}{4}$ of $4\pi = \pi$ → max.

$\frac{1}{2}$ of $2\pi = \pi$ → x-int

$\frac{1}{2}$ of $4\pi = 2\pi$ → x-int

Ex5) y = sinx + 2