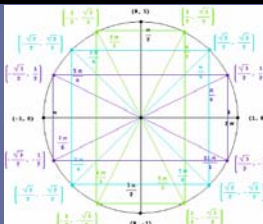


Unit 4: Trigonometry



4.6 Trigonometric Graphs

Terminology:

Periodic Function - a function that repeats itself after a certain amount of time

Period - time to complete one cycle

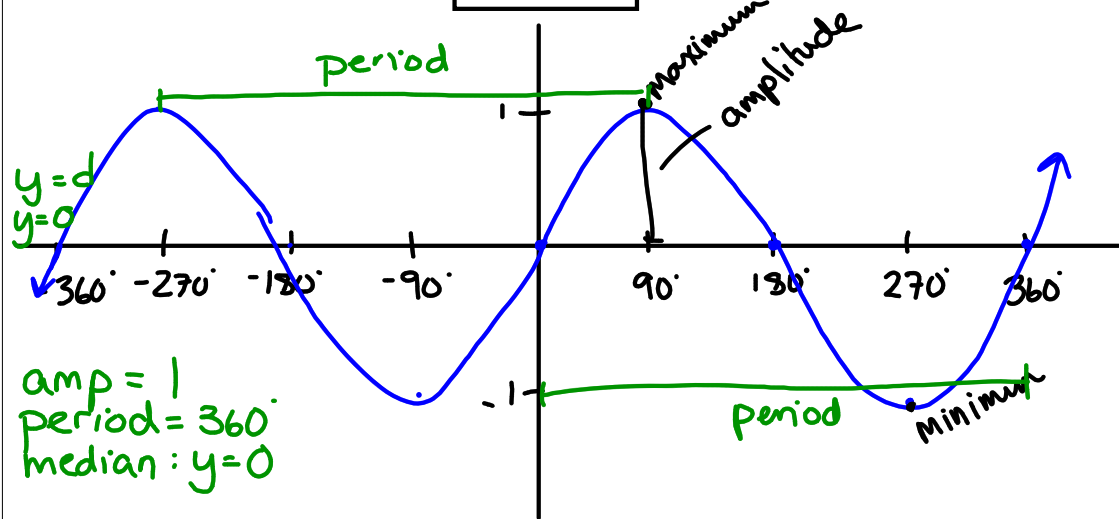
Sinusoidal Functions - wavy functions like Sine or Cosine

Median - middle of the graph

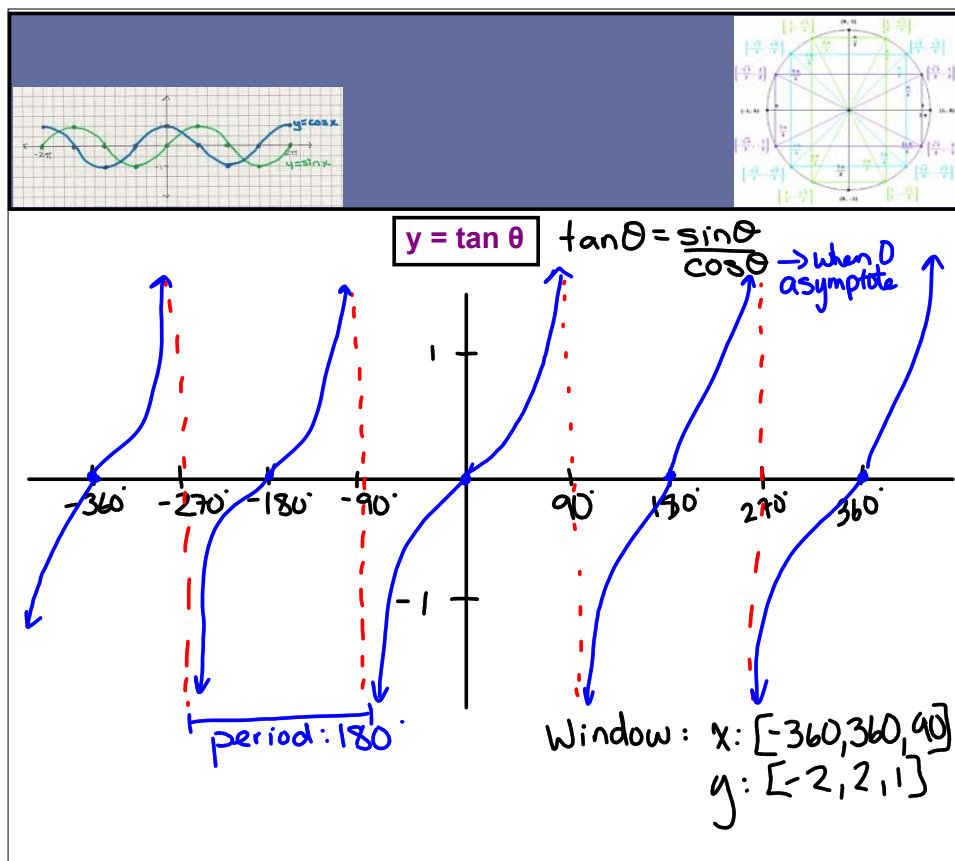
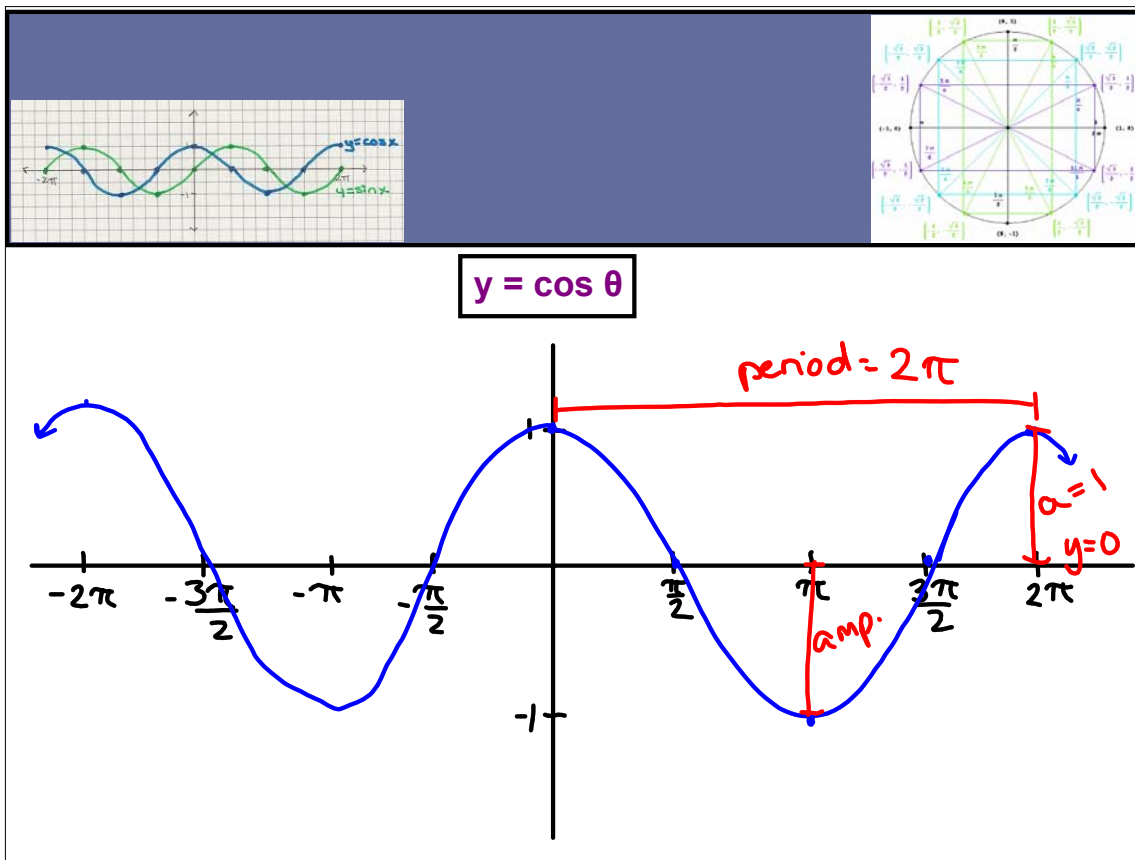
Amplitude - distance from the median to the max. or min. value

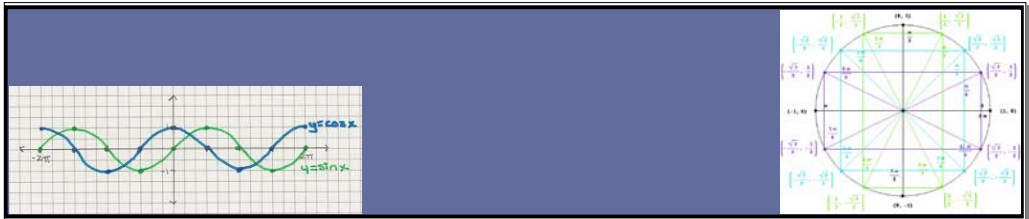



$y = \sin \theta$



amp = 1
 period = 360°
 median: $y = 0$





Transformations of Sinusoidal Graphs:

$$y = a f[b(x-h)] + k$$

$$y = a \sin[b(x-c)] + d$$

$$y = a \cos[b(x-c)] + d$$

*

$$P = \frac{2\pi}{b}$$

a: vertical stretch (amplitude)

b: horizontal stretch of $\frac{1}{b}$ (period: $\frac{360}{b}$, $\frac{2\pi}{b}$)

c: horizontal translation (phase shift)

d: vertical translation (median $y = d$)

$$\begin{aligned} \rightarrow \text{max: } d + a \\ \text{min: } d - a \end{aligned}$$

Ex.) Compare the following and state the characteristics:

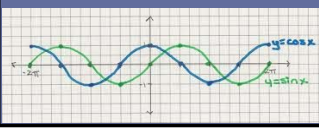
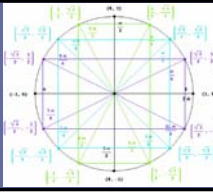
a) $\sin x$ and $2\sin x$ $y = 2\sin x$

$y = \sin x$

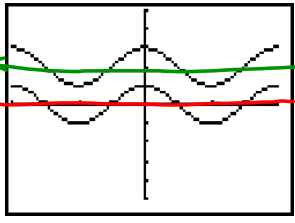
VS of 2 amp: 2
 max: 2
 min: -2
 median: $y = 0$
 Range: $[-2, 2]$
 Period: 360° or 2π

b) $\sin x$ and $-3\sin x$

VS of 3 amp: 3
 VR about x-axis
 median: $y = 0$
 max: 3
 min: -3
 Range: $[-3, 3]$
 $\{y \mid -3 \leq y \leq 3, y \in \mathbb{R}\}$
 Period: 360° or 2π
 Pg. 233
 #4-8.

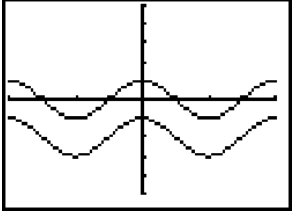



c) $\cos x$ and $\cos(x) + 2$ ~~$-\cos(x+2)$~~
 $\cos x + 2$

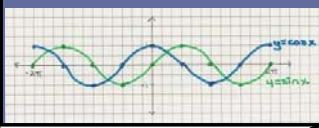
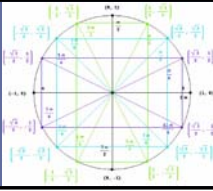


VT up 2
 median: $y=2$
 $d+a$ { max: 3
 $d-a$ { min: 1
 range: $[1, 3]$
 period: 360°
 amp: 1

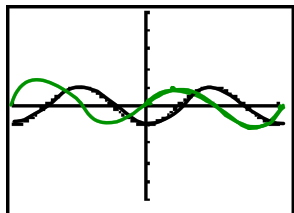
d) $\cos x$ and $\cos(x) - 2$



VT 2 down
 median: $y=-2$
 $d+a$ { max: -1
 $d-a$ { min: -3
 range: $[-3, -1]$
 amp: 1
 Period: 360°

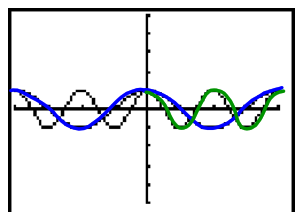



e) $\sin x$ and $\sin(x - 90^\circ)$ mode



HT 90° right (phaseshift of 90° right)
 Range: $[-1, 1]$
 Period: 360°

f) $\cos x$ and $\cos(2x)$



HS of $\frac{1}{2}$
 Period = $\frac{360^\circ}{b} = \frac{360^\circ}{2} = 180^\circ$

Pg. 233 # 4-11, 13, 15.

