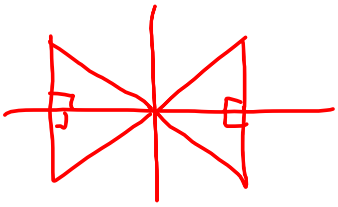
**Regents Review #8 - Trigonometry & Conics**

**Unit Circle Trigonometry:**

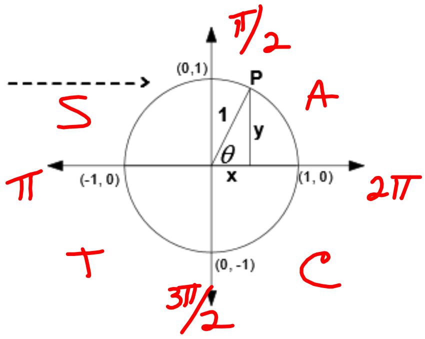
P( cos(θ) , sin(θ) )

$\sin^2(\theta) + \cos^2(\theta) = 1$

$\tan(\theta) = \dfrac{\sin(\theta)}{\cos(\theta)}$



**Review unit circle --------->**




Degrees to radian: degrees x $\dfrac{\pi}{180^\circ}$ Radians to degrees: radians x $\dfrac{180^\circ}{\pi}$

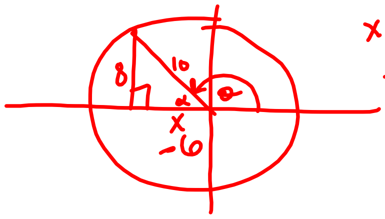
Arc length formula: $S = \theta r$
radians

**Example:**

A circle centered at the origin has a radius of 10 units. The terminal side of an angle, θ, intercepts the circle in Quadrant II at point C. The y-coordinate of point C is 8. What is the value of cos(θ)?

| | |
|---|---|
| 1. -3/5 | 3. -3/4 |
| 2. 3/5 | 4. 4/5 |

$\frac{-6}{10}$




$x^2 + 8^2 = 10^2$
$x^2 + 64 = 100$
$\sqrt{x^2} = \sqrt{36}$
$x = \pm 6$

**Trig Graphing/Modeling:**

$y = A\sin[\omega(x) - h] + k$ Identify:

Amplitude: $|A|$

Range: min: $k - |A|$ max: $k + |A|$

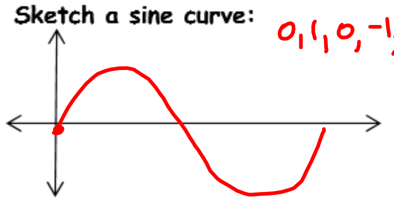
Frequency: $\omega / 2\pi$ ω cycles in 2π

Phase shift: h x-h → Rt x+h → left

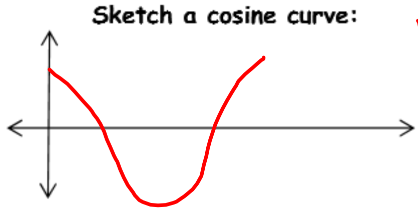
Vert. Shift (midline): k +k up -k down y=k

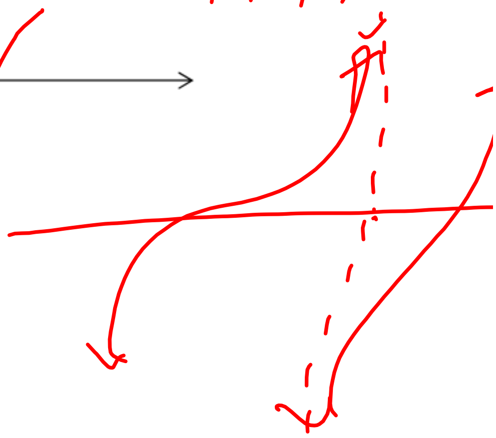
Period: $\dfrac{2\pi}{\omega}$

**Sketch a sine curve:** 0, 1, 0, -1, 0



**Sketch a cosine curve:** 1, 0, -1, 0, 1





Tangent is undefined at what values of x? odd $\frac{\pi}{2}$'s

Example:

Relative to the graph of y = 3sinx, what is the phase shift of the graph of $y = 3\sin\left(x + \frac{\pi}{3}\right)$ ?

1. $\frac{\pi}{3}$ right
2. $\frac{\pi}{3}$ up
3. $\frac{\pi}{3}$ left
4. $\frac{\pi}{3}$ down

**Changing Conics to Standard form (good for graphing purposes):**

1. Rearrange the terms:

   a. For a circle: Group all x terms together and all y terms together on one side of the equal sign, with the constant on the other side.

   b. For a parabola: Group the variable with the squared term on one side, and the non-squared variable and constant on the other side.

2. Complete the square twice (once for the x's and once for the y's) for a circle and once for a parabola. Remember, $x^2$ and $y^2$ cannot have a coefficients when completing the square, so sometimes you may have to factor that coefficient out by GCF first (x's and y's separately).

**Example 1** - Write the equation in standard form and identify the center and radius.

circle

$$x^2 + y^2 + 8x - 10y - 8 = 0$$

$$\boxed{\phantom{x}} = \left(\frac{b}{2}\right)^2$$

$$x^2 + 8x + \boxed{16} + y^2 - 10y + \boxed{25} = 8 + \boxed{16} + \boxed{25}$$

$$(x+4)^2 + (y-5)^2 = 49 \leftarrow r^2$$

center = $(-4, 5)$

$r = 7$

**Example 2** - Parabola: Write the equation in standard form. Identify the vertex and which direction it opens.

$$x^2 - 4x - 4y + 8 = 0$$

$$x^2 - 4x + \boxed{4} = 4y - 8 + \boxed{4}$$

$$(x-2)^2 = 4y - 4$$

$$(x-2)^2 = \underset{\substack{\uparrow \\ 4p}}{4}(y-1)$$

vertex = $(2, 1)$

up