Solving Trig Equations

SWBAT solve equations involving trigonometry by using their calculator.

Example 1: Solve the equation in the interval from 0 to 2π.
- ❖ Y_1 = Left side of equation, Y_2 = right side of equation
- ❖ Find the intersections (solution is the x-value)

a) $\cos 2t = \dfrac{1}{2}$

$X = 0.52, 2.62, 3.67, 5.76$

b) $-2\cos \pi\theta = 0.3$

$X = 0.55, 1.45, 2.55, 3.45, 4.55, 5.45$

c) $\tan\theta = 2$

$X = 1.12, 4.25$

d) $6\tan 2\theta = 1$

$X = 0.08, 1.65, 3.22, 4.79$

4.79

In-Class Practice: Solve for x. Show all work.

a) $\sin x = 0.67, \quad 0 \le x < 2\pi$

$X = 0.73, 2.41$

b) $4\sin x + 5 = 0, \quad 0 \le x < 2\pi$

No solution

c) $4\sec x + 8 = 0, \quad 0 \le x < 2\pi$

$X = 2.09, 4.19$

d) $\cot x - \sqrt{3} = 0, \quad 0 \le x < 2\pi$

$\dfrac{1}{\tan x} - \sqrt{3} = 0$

$X = 0.52, 3.67$

e) $3\cot^2 x - 1 = 0, \quad 0 \le x < 2\pi$

$\dfrac{3}{(\tan(x)\tan(x))} - 1$

$X = 1.05, 2.09, 4.19, 5.24$

f) $2\sin^2 x + 5\sin x = 3, \quad 0 \le x < 2\pi$

$2\sin(x)\sin(x) + 5\sin(x) = 3$

$X = 0.52, 2.62$

g) $2\tan^2 x - \tan x - 6 = 0, \quad 0 \le x < 2\pi$

$X = 1.11, 2.16, 4.25, 5.3$

h) $\sec x \sin x - 3\sin x = 0, \quad 0 \le x < 2\pi$

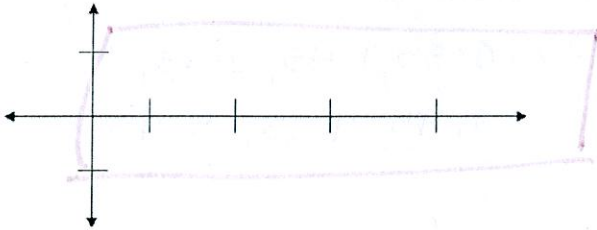$\dfrac{1}{\cos(x)} \cdot \dfrac{\sin(x)}{1} - 3\sin(x) = 0$

$\dfrac{\sin(x)}{\cos(x)} - 3\sin(x) = 0$

$X = 0, 1.23, 3.14, 5.05$

Part 2: Graphing Trig Functions Review

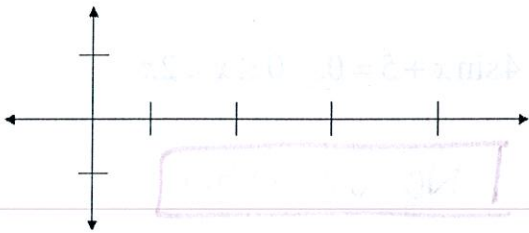**Directions:** *Show all work and tables on a separate page. Only graph your functions on this page.*

1. Graph the sine function is the amplitude is 2 and the period is $\frac{2\pi}{3}$.
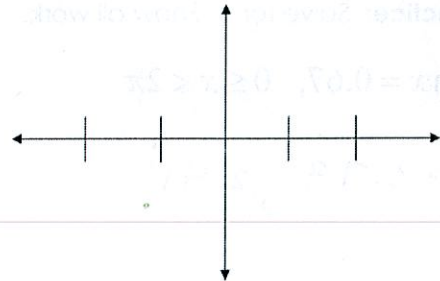
2. Graph $y = -\sin 2\theta$
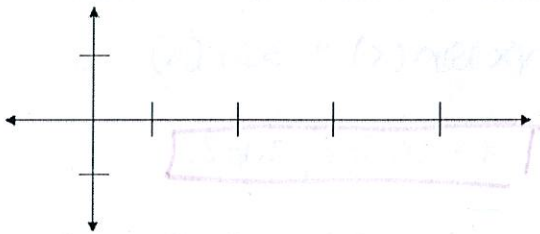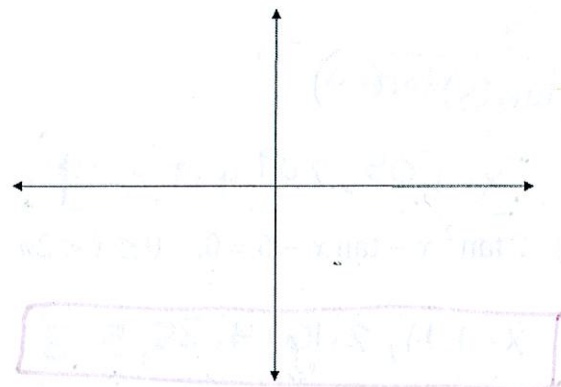
3. Graph $y = 3\cos\frac{\theta}{2}$

4. Graph $y = 3\tan 2\theta$
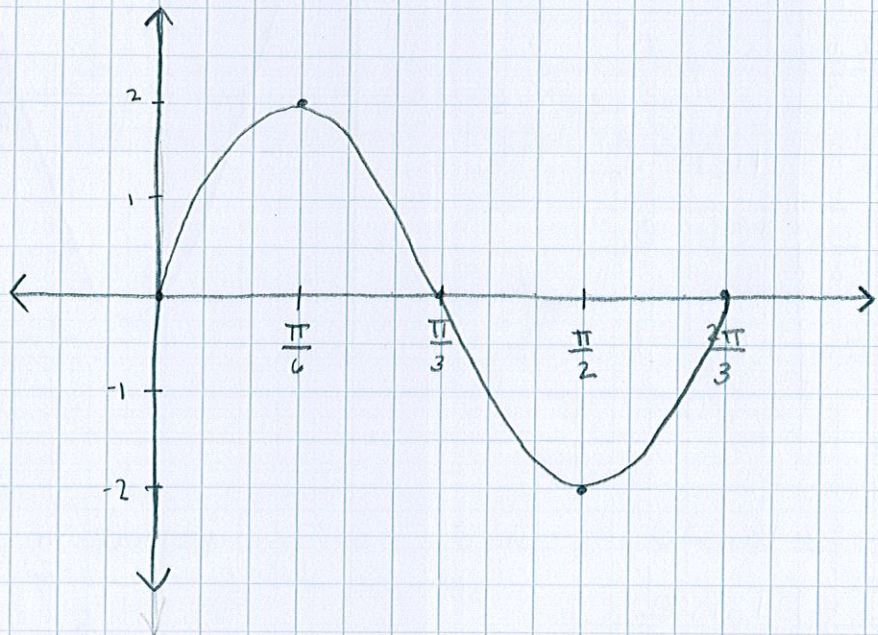
5. Graph $y = 2\csc \pi\theta$

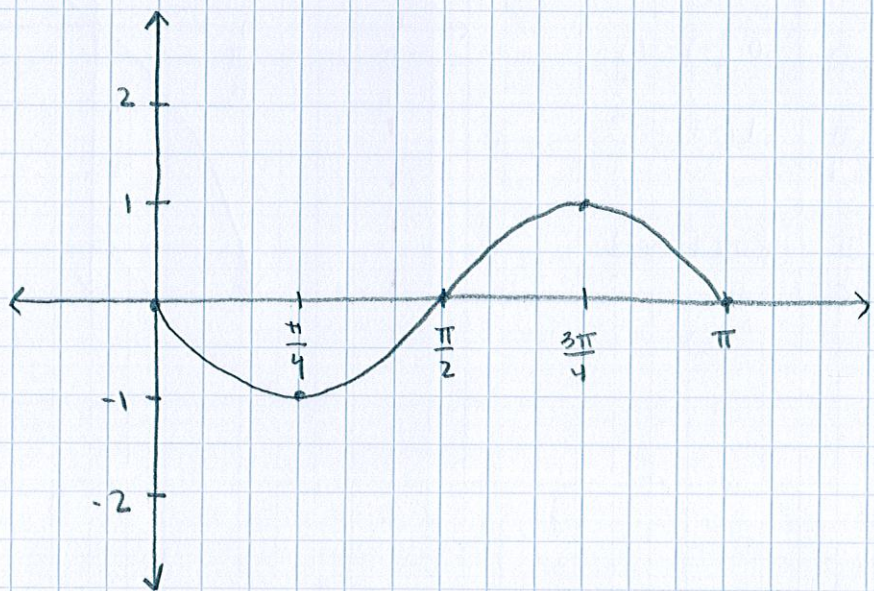6. Graph $y = 3\sin\left(\theta + \frac{\pi}{3}\right) - 2$

Part 2 Review

1. $a = 2$ $b = 3$ period $= \dfrac{2\pi}{3}$ $y = 2\sin 3\theta$

θ	$\sin\theta$
$\underline{0} = \left(\dfrac{1}{3}\right) 0$	$0(2) = \underline{0}$
$\underline{\dfrac{\pi}{6}} = \left(\dfrac{1}{3}\right)\dfrac{\pi}{2}$	$1(2) = \underline{2}$
$\underline{\dfrac{\pi}{3}} = \left(\dfrac{1}{3}\right)\pi$	$0(2) = \underline{0}$
$\underline{\dfrac{\pi}{2}} = \left(\dfrac{1}{3}\right)\dfrac{3\pi}{2}$	$-1(2) = \underline{-2}$
$\underline{\dfrac{2\pi}{3}} = \left(\dfrac{1}{3}\right) 2\pi$	$0(2) = \underline{0}$

2. $y = -1\sin 2\theta$ $a = -1$ $b = 2$ period $= \dfrac{2\pi}{2} = \pi$

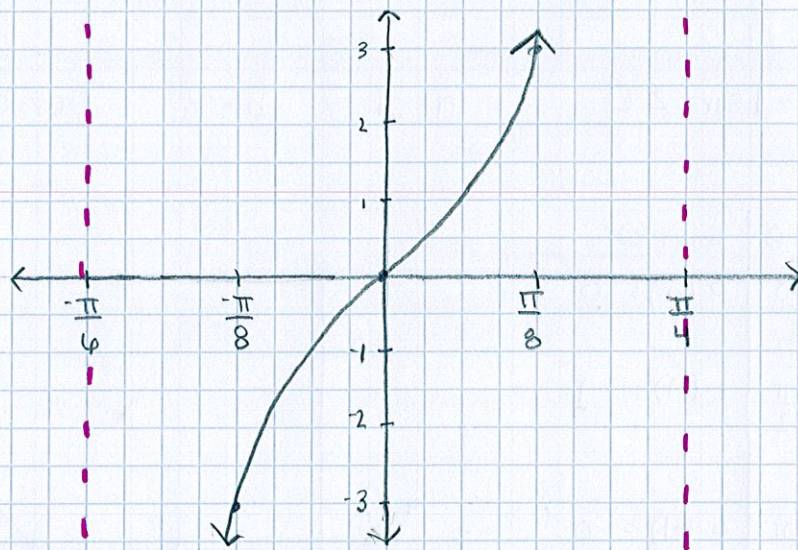| θ	$\sin\theta$
$\underline{0} = \left(\dfrac{1}{2}\right) 0$	$0(-1) = \underline{0}$
$\underline{\dfrac{\pi}{4}} = \left(\dfrac{1}{2}\right)\dfrac{\pi}{2}$	$1(-1) = \underline{-1}$
$\underline{\dfrac{\pi}{2}} = \left(\dfrac{1}{2}\right)\pi$	$0(-1) = \underline{0}$
$\underline{\dfrac{3\pi}{4}} = \left(\dfrac{1}{2}\right)\dfrac{3\pi}{2}$	$-1(-1) = \underline{1}$
$\underline{\pi} = \left(\dfrac{1}{2}\right) 2\pi$	$0(-1) = \underline{0}$

3. $y = 3 \cos \dfrac{\theta}{2}$ $a = 3$ $b = \dfrac{1}{2}$ period $= \dfrac{2\pi}{\frac{1}{2}} = 2\pi \cdot \dfrac{2}{1} = 4\pi$

θ	$\cos \theta$
$0 = (2)\ 0$	$1(3) = 3$
$\pi = (2)\ \dfrac{\pi}{2}$	$0(3) = 0$
$2\pi = (2)\ \pi$	$-1(3) = -3$
$3\pi = (2)\ \dfrac{3\pi}{2}$	$0(3) = 0$
$4\pi = (2)\ 2\pi$	$1(3) = 3$
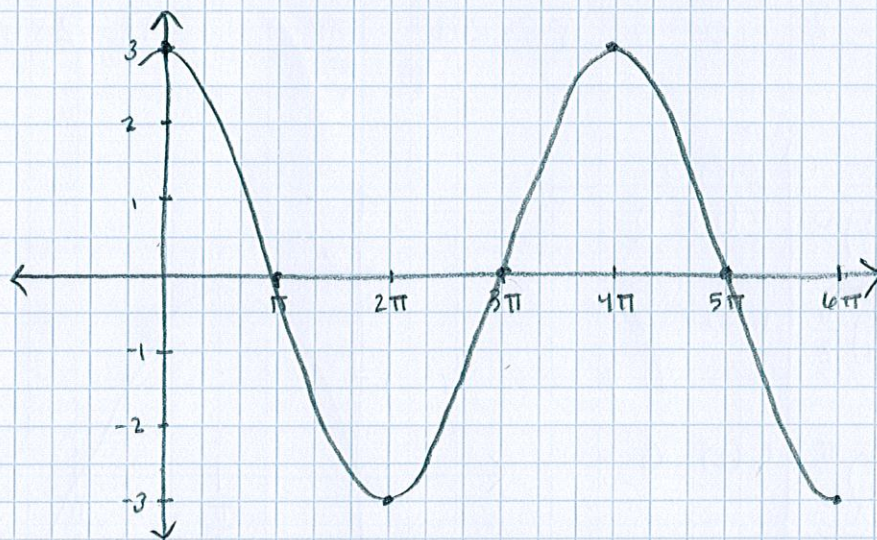
4. $y = 3 \tan 2\theta$ $a = 3$ $b = 2$ period $= \dfrac{\pi}{2}$

θ	$\tan \theta$
$\dfrac{-\pi}{6} = \left(\dfrac{1}{2}\right)\ \dfrac{-\pi}{2}$	undefined
$\dfrac{-\pi}{8} = \left(\dfrac{1}{2}\right)\ \dfrac{-\pi}{4}$	$-1(3) = -3$
$0 = \left(\dfrac{1}{2}\right)\ 0$	$0(3) = 0$
$\dfrac{\pi}{8} = \left(\dfrac{1}{2}\right)\ \dfrac{\pi}{4}$	$1(-3) = -3$
$\dfrac{\pi}{4} = \left(\dfrac{1}{2}\right)\ \dfrac{\pi}{2}$	undefined

5. $y = 2 \csc \pi \theta$ $\Rightarrow$ $y = 2 \sin \pi \theta$ $\qquad a = 2 \qquad b = \pi \qquad$ period $= \frac{2\pi}{\pi} = 2$

θ	$\sin \theta$
$0 = \left(\frac{1}{\pi}\right) 0$	$0 \ (2) = \underline{0}$
$\frac{1}{2} = \left(\frac{1}{\pi}\right)\frac{\pi}{2}$	$1 \ (2) = \underline{2}$
$1 = \left(\frac{1}{\pi}\right)\pi$	$0 \ (2) = \underline{0}$
$\frac{3}{2} = \left(\frac{1}{\pi}\right)\frac{3\pi}{2}$	$-1 \ (2) = \underline{-2}$
$2 = \left(\frac{1}{\pi}\right) 2\pi$	$0 \ (2) = \underline{0}$
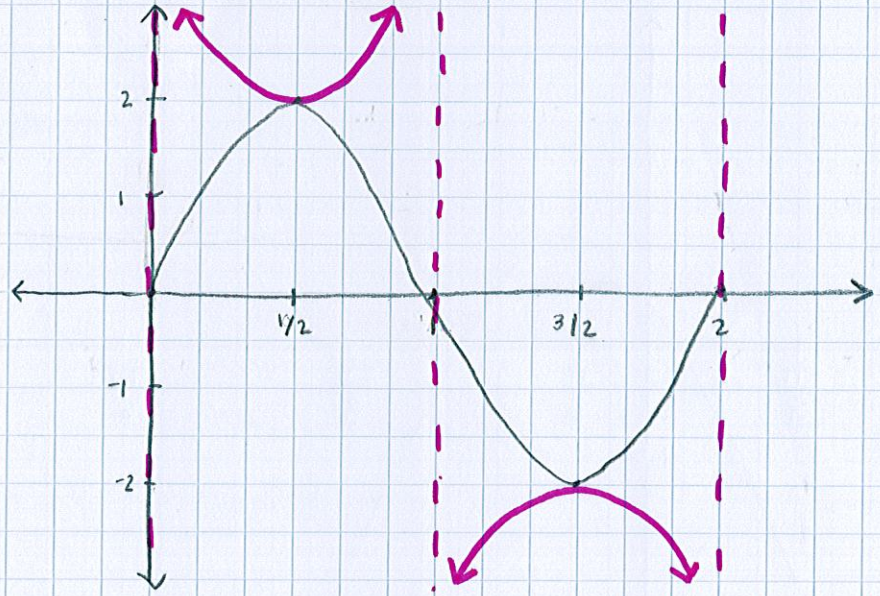
6. $y = 3 \sin \left(\theta + \frac{\pi}{3}\right) - 2$ $\qquad a = 3 \qquad b = 1 \qquad L \frac{\pi}{3} \quad D -2$

Left $\pi/3$		$\frac{1}{b}$	θ	$\sin \theta$	Down 2
$\frac{\pi}{3} = \frac{-\pi}{3} + \frac{0}{3}$	$= \frac{-\pi}{3} + 0 = \left(\frac{1}{1}\right)$		0	$0 \ (3) = 0 - 2 =$	$\underline{-2}$
$\frac{\pi}{6} = \frac{-2\pi}{6} + \frac{3\pi}{6}$	$= \frac{-\pi}{3} + \frac{\pi}{2} = \left(\frac{1}{1}\right)$		$\frac{\pi}{2}$	$1 \ (3) = 3 - 2 =$	$\underline{1}$
$\frac{2\pi}{3} = \frac{-\pi}{3} + \frac{3\pi}{3}$	$= \frac{-\pi}{3} + \pi = \left(\frac{1}{1}\right)$		π	$0 \ (3) = 0 - 2 =$	$\underline{-2}$
$\frac{7\pi}{6} = \frac{-2\pi}{6} + \frac{9\pi}{6}$	$= \frac{-\pi}{3} + \frac{3\pi}{2} = \left(\frac{1}{1}\right)$		$\frac{3\pi}{2}$	$-1 \ (3) = -3 - 2 =$	$\underline{-5}$
$\frac{5\pi}{3} = \frac{-\pi}{3} + \frac{6\pi}{3}$	$= \frac{-\pi}{3} + 2\pi = \left(\frac{1}{1}\right)$		2π	$0 \ (3) = 0 - 2 =$	$\underline{-2}$

Final Table:

θ	$\frac{-\pi}{3}$	$\frac{\pi}{6}$	$\frac{2\pi}{3}$	$\frac{7\pi}{6}$	$\frac{5\pi}{3}$
$\sin \theta$	-2	1	-2	-5	-2

graph on next
page $\rightarrow$

$$y = 3\sin\left(\theta + \frac{\pi}{3}\right) - 2$$
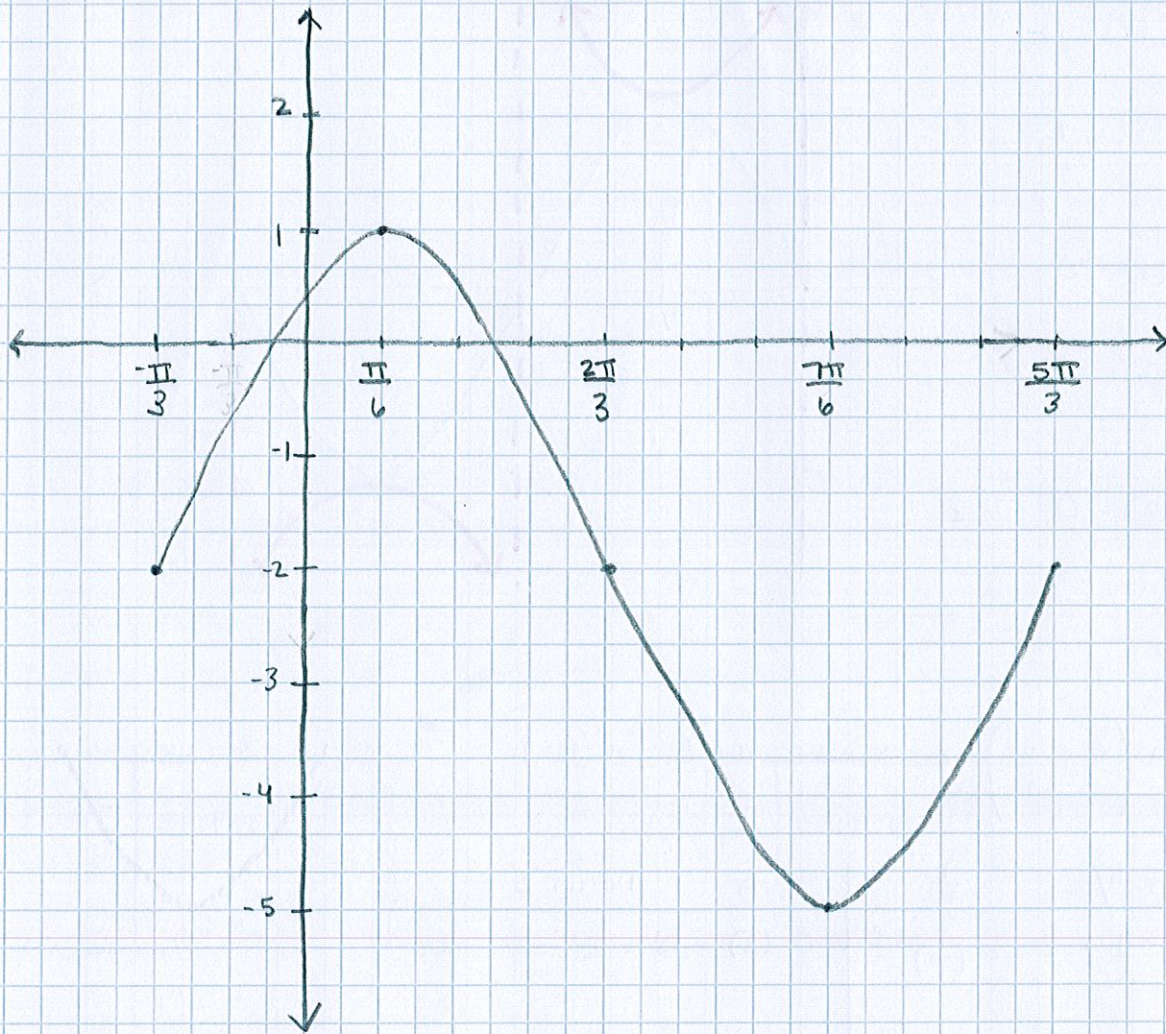
Also Study:

* How to write an equation with given transformations
* How to tell me what the transformations are
* What the <u>exact</u> value of csc, sec, and tan of an angle are by using the unit circle

     ie: $\sec\left(\frac{\pi}{2}\right)$ or $\tan\left(\frac{3\pi}{4}\right)$

* What the decimal value of csc, sec, and tan of an angle are by using the calculator.

* solving trig equations using calculator $y=$