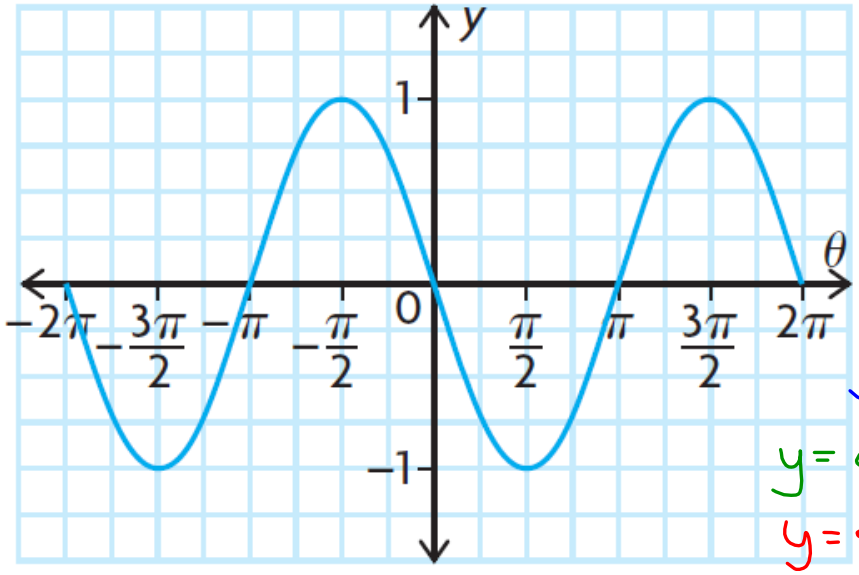
Trigonometry Survivor Challenge... What's the curve?

Survivor



$y = -\sin x$

$y = \cos\left(x + \frac{\pi}{2}\right)$

$y = \sin(x + \pi)$

$y = -\cos\left(x - \frac{\pi}{2}\right)$

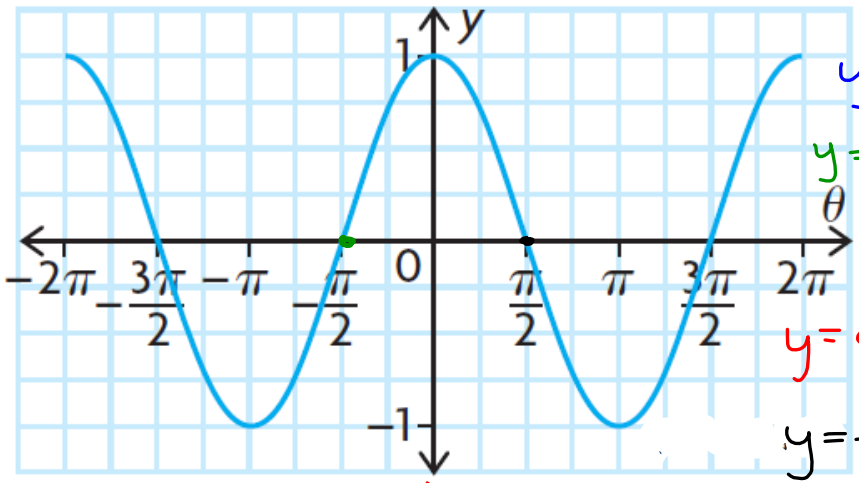
Find an equation to model this curve. You will submit your answer.

If your equation is wrong... you are kicked off the math island!

If your equation matches someone else's... you are BOTH kicked off.

WHO WILL BE THE SURVIVOR?

Challenge #2...



$y = \cos x$

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

$y = \cos(x + 6\pi)$

$y = -\sin\left(x - \frac{\pi}{2}\right)$

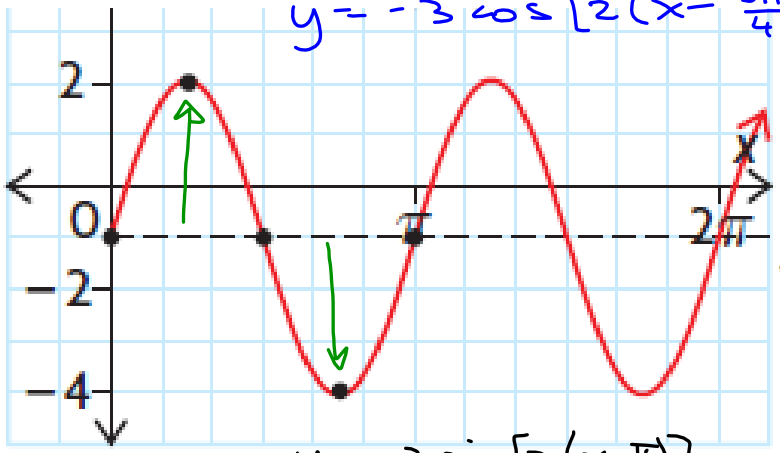
$y = -\cos(x + \pi)$

$y = \cos(x + 2\pi)$

Challenge #3...

$y = 3\sin 2x - 1$

$y = -3\cos\left[2\left(x - \frac{3\pi}{4}\right)\right] - 1$



$y = -3\sin\left[2\left(x - \frac{\pi}{2}\right)\right] - 1$ ✓

$y = 3\cos\left[2\left(x - \frac{\pi}{4}\right)\right] - 1$

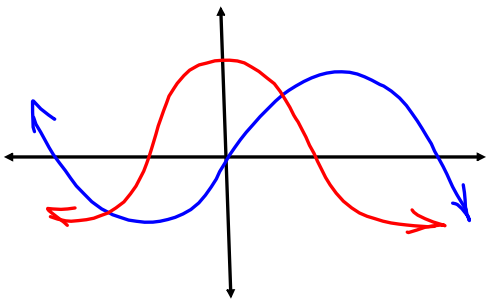
7.1 Equivalent Trig Functions

what they are - different expressions that result in the same value for all angles

1. Period Equivalence - by shifting a function by one period, you can obtain the equiv of another function

$$\cos(x) = \cos(x + 2\pi n)$$
$$\sin(x) = \sin(x + 2\pi n)$$
$$\tan(x) = \tan(x + \pi n)$$
$$n \in I$$

2. Symmetry Equivalence -



EVEN → reflected in y-axis

$f(x) = f(-x)$

$\cos x$ is Even

$\cos x = \cos(-x)$

ODD → reflected about the origin

$f(x) = -f(-x)$

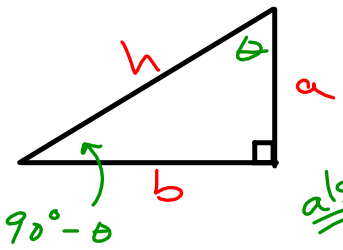
$\sin x$ is ODD

$\sin x = -\sin(-x)$

$\sin(-x) = -\sin(x)$

3. Complimentary Function Equivalence (COFUNCTIONS)

adds to 90°



$\sin\theta = \frac{b}{h}$ but $\cos\left(\frac{\pi}{2}-\theta\right) = \frac{b}{h}$

$\therefore \sin\theta = \cos\left(\frac{\pi}{2}-\theta\right)$

also $\cos\theta = \frac{a}{h}$ but $\sin\left(\frac{\pi}{2}-\theta\right) = \frac{a}{h}$

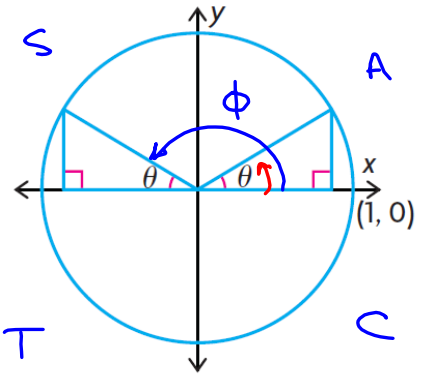
$\therefore \cos\theta = \sin\left(\frac{\pi}{2}-\theta\right)$

$\tan\theta = \cot\left(\frac{\pi}{2}-\theta\right)$

$\sec\theta = \csc\left(\frac{\pi}{2}-\theta\right)$

4. Principal Angle - Related Acute Angle Equivalence (CAST rule)

$\theta + \phi = 180°$

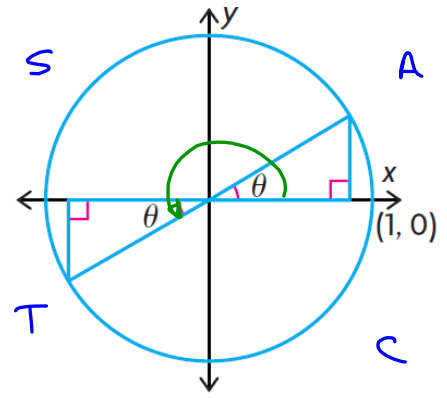


$\cos\theta = -\cos\phi$

$\sin\theta = \sin\phi$

$\tan\theta = -\tan\phi$

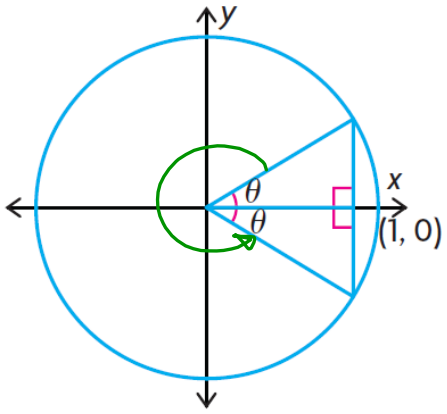
Your turn...



$\sin\theta = -\sin(\pi+\theta)$

$\cos\theta = -\cos(\pi+\theta)$

$\tan\theta = \tan(\pi+\theta)$



$\sin\theta = -\sin(2\pi-\theta)$

$\cos\theta = \cos(2\pi-\theta)$

$\tan\theta = -\tan(2\pi-\theta)$

Example 1) Use the cofunction to write an equivalent expression

(a) $\cos\frac{5\pi}{12}$

$= \sin\left(\frac{\pi}{2} - \frac{5\pi}{12}\right)$

$= \sin\left(\frac{6\pi}{12} - \frac{5\pi}{12}\right)$

$= \sin\left(\frac{\pi}{12}\right)$

(b) $\cos\frac{5\pi}{16}$

$= \sin\left(\frac{\pi}{2} - \frac{5\pi}{16}\right)$

$= \sin\left(\frac{8\pi}{16} - \frac{5\pi}{16}\right)$

$= \sin\left(\frac{3\pi}{16}\right)$

(c) $\tan\frac{\pi}{6}$

$= \cot\left(\frac{\pi}{2} - \frac{\pi}{6}\right)$

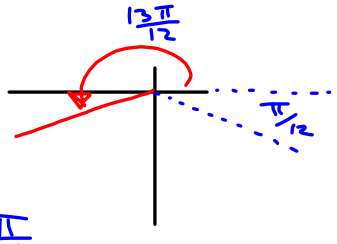
$= \cot\left(\frac{3\pi}{6} - \frac{\pi}{6}\right)$

$= \cot\left(\frac{2\pi}{6}\right)$

$= \cot\left(\frac{\pi}{3}\right)$

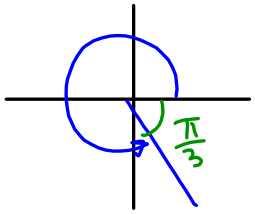
Example 2) Use a CAST rule (related acute angle) identity to write an equivalent expression

(a) $\cos\dfrac{13\pi}{12}$



$= -\cos\frac{\pi}{12}$

(b) $\tan\dfrac{5\pi}{3}$



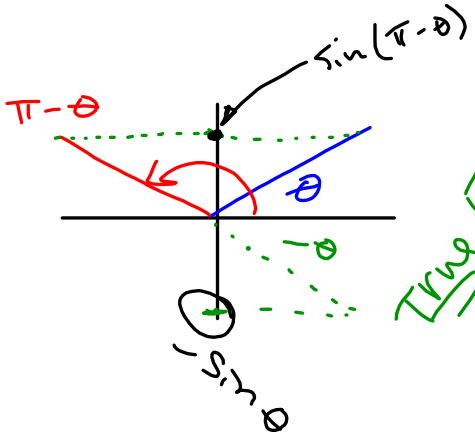
$= \tan\left(-\frac{\pi}{3}\right)$

$= -\tan\left(\frac{\pi}{3}\right)$

True or False?

$$\sin(\pi-\theta) = -\sin\theta$$

false

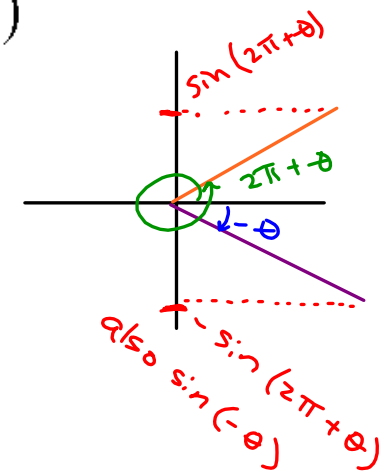


True $\sin\pi-\theta=\sin\theta$

True or False?

$$-\sin(2\pi+\theta) = \sin(-\theta)$$

True



also $\sin(-\theta)$

Homefun

page 392 #3ace, 5ace, 7ace