MAT 1420-R11 Remote College Trigonometry Spring, 2024
SCHEDULE Page 1

Week	Where We're At	Monday's Date
1	Startup Activities, Sec 1.1	1/15
2	Secs 1.2, 1.3	1/22
3	Secs 1.4, 1.5, 1.6	1/29
4	Secs 1.6, 1.7, 1.8	2/5
5	Test 1, Due Wednesday, 2/14 Sec 2.1, Part I	2/12

There's a lot of drill-and-kill about memorizing the 12-point unit circle in/ the book. Instead, learn the 0-degree, 30-degree, 45-degree 60-degree , and 90-degree right triangles in Quadrant I. *Reason* your way to the rest and you will be much more intuitive/stronger.

Graphs of sine, cosine and tangent.

Shifting and stretching graphs, in general.

Fitting a sine or a cosine function to a data set.

Questions?

Quadrant Angles for sine.

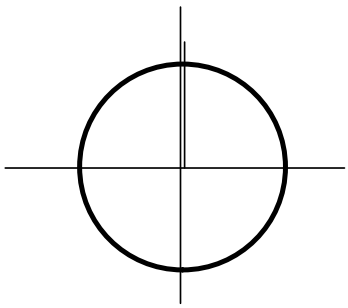
$$f := x \to \sin(x)$$

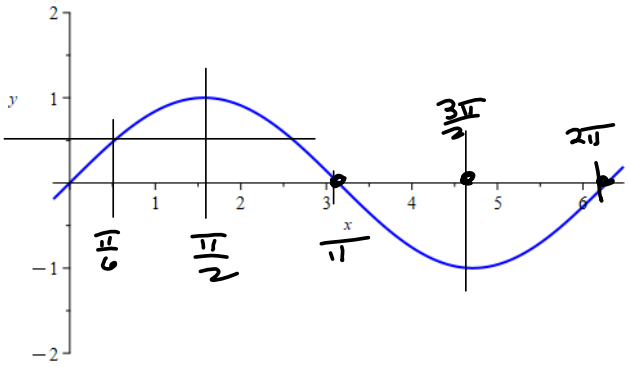
$$f(0), f\left(\frac{\text{Pi}}{2}\right), f(\text{Pi}), f\left(\frac{3 \cdot \text{Pi}}{2}\right), f(2 \cdot \text{Pi})$$

$$0,\ 1,\ 0,\ -1,\ 0$$

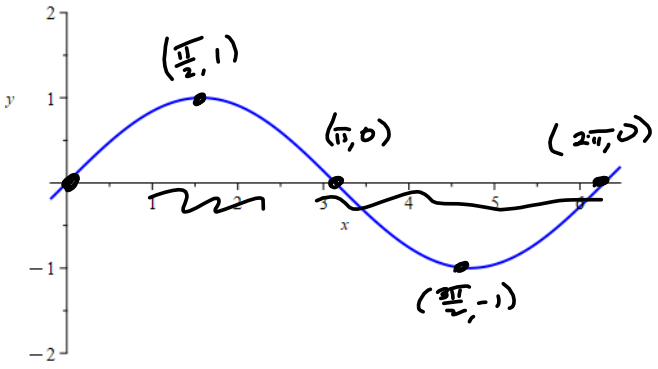
Recall all the right-angle trigonometry we did?

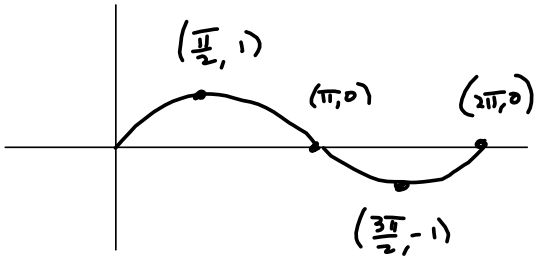
Recall the definition of sine in 1.2? We'll use that to rought this in:



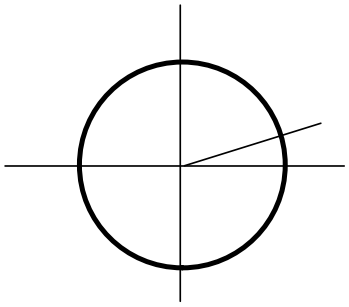


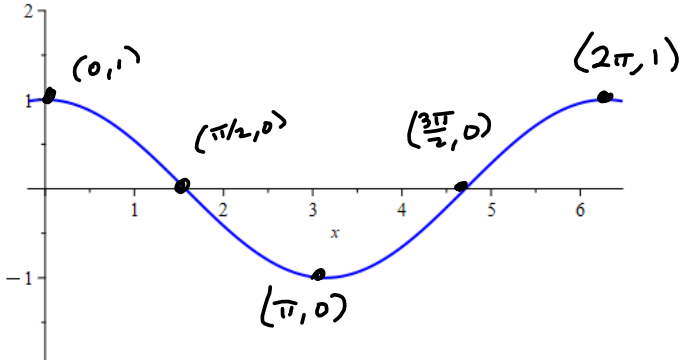
sin(*t*) is the *y*-coordinate of a point on the unit circle corresponding to the angle *t*, in radians.

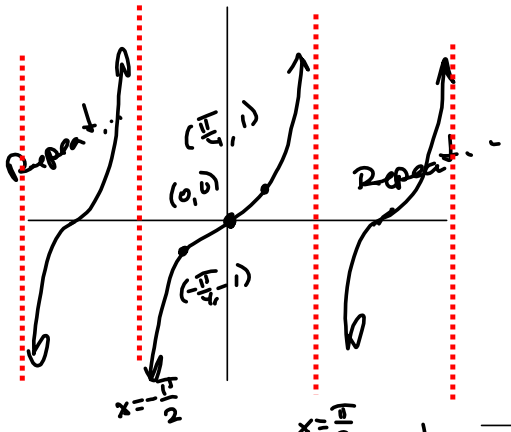




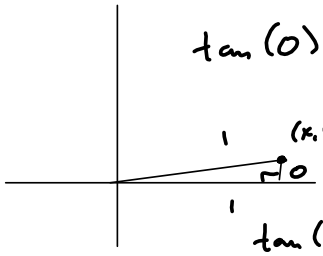
Cosine is the x-coordinate corresponding to t in rad. ans.



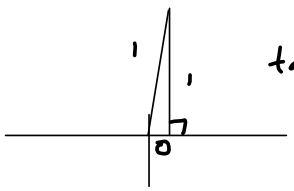




$\tan(0) =$

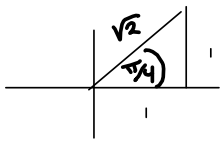


$\tan(0) = \frac{0}{1} = 0$



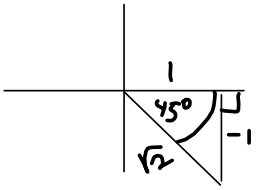
$\tan(\frac{\pi}{2}) = \frac{1}{0}$ DNE!

$\tan(\frac{\pi}{4}) = \frac{1}{1} = 1$



Period is π radians or 180°.

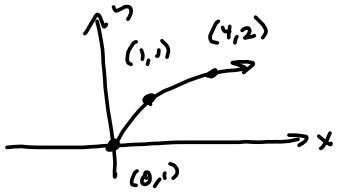
$\tan(-\frac{\pi}{4})$



$\tan(-\frac{\pi}{4}) = \frac{-1}{1} = -1$

Rules for transforming (and building?) functions.

Basic Function. $f(x) = \sqrt{x}$ is a basic function



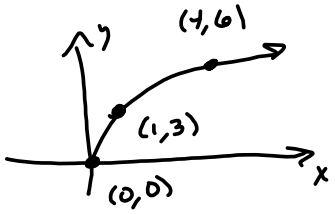
$f(x) = \sqrt{x}$

There are only 4 moves!!!!

$af(x)$: $y \longmapsto ay$

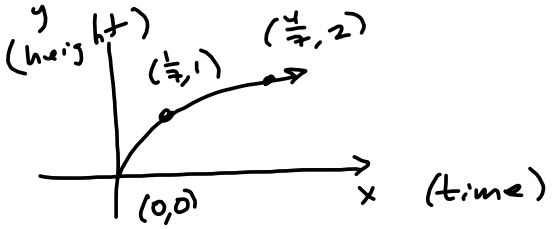
$g(x) = 3\sqrt{x} = 3f(x)$

$(x,y) \longmapsto (x,3y)$



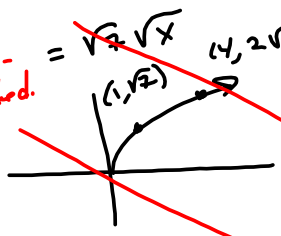
$f(bx)$: $x \longmapsto \frac{1}{b}x$

$g(x) = \sqrt{7x}$ $\quad x \longmapsto \frac{1}{7}x$



$g(x) = \sqrt{7x}$

NOT Recommended. $= \sqrt{7}\sqrt{x}$

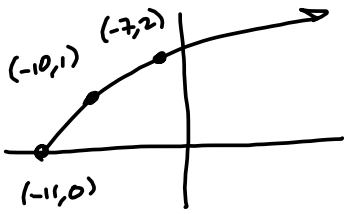


But don't. Don't factor the '7' out of the "√".

$f(x+c)$: $x \longmapsto x-c$

$g(x) = \sqrt{x+11} = f(x+11)$

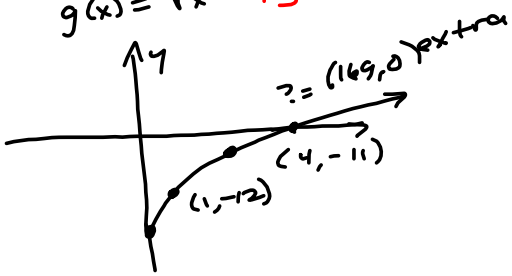
Left 11 !



$g(x) = \sqrt{x+11} = f(x+11)$

$f(x)+d \qquad y \longmapsto y+d$

$g(x) = \sqrt{x} - 13$



?

$\sqrt{x} - 13 = 0$

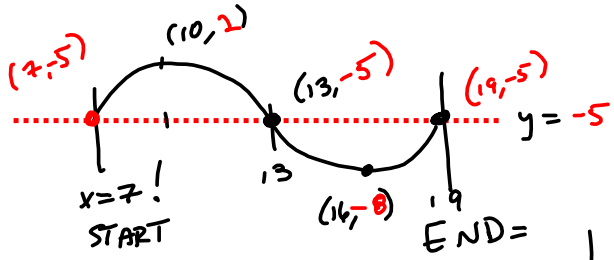
$\sqrt{x} = 13$

$x = 13^2 = 169$

Do this for a sine !

$g(x) = 3\sin\left(\frac{\pi}{6}x - \frac{7\pi}{6}\right) - 5$

$= 3\sin\left(\frac{\pi}{6}(x-7)\right) - 5$



$\frac{19+7}{2} = 13$

Beauty !

$\frac{\frac{7\pi}{6}}{\frac{\pi}{6}} = \frac{7\pi}{6}\cdot\frac{6}{\pi} = 7$

$\sin(x)$ has Period 2π

What is the period of $\sin\left(\frac{\pi}{6}x\right)$?

when is $\frac{\pi}{6}x = 2\pi$?

$x = 2\pi\left(\frac{6}{\pi}\right) = 12 = \text{Period!}$

$= T$

Month, t	Las Vegas, L	International Falls, I
1	57.1	13.8
2	63.0	22.4
3	69.5	34.9
4	78.1	51.5
5	87.8	66.6
6	98.9	74.2
7	104.1	78.6
8	101.8	76.3
9	93.8	64.7
10	80.8	51.7
11	66.0	32.5
12	57.3	18.1

Spreadsheet at LarsonPrecalculus.com

) A model for the temperatures in Las Vegas is

$$L(t) = 80.60 + 23.50\cos\left(\frac{\pi t}{6} - 3.67\right).$$

Ugh!

Use Cosine & high & low point.

$g(x) = a\cos(b(x-c)) + d$

Period = 12:

We want $bx = 2\pi$ when $x = 12$

$b \cdot 12 = 12b = 2\pi$

$b = \frac{2\pi}{12} = \frac{\pi}{6}$

$a\cos\left(\frac{\pi}{6}(x-c)\right) + d$

Find midline:

$\frac{\text{High} + \text{Low}}{2}$

$= \frac{104.1 + 57.1}{2} = \frac{161.2}{2} = 80.6$

80.6 ARITHMETIC!

$a\cos\left(\frac{\pi}{6}(x-c)\right) + 80.6$

a = Departure/Max from midline.

$\frac{\text{High} - \text{Low}}{2} = \frac{104.1 - 57.1}{2}$

$= \frac{47}{2} = 23.5$

$23.5\cos\left(\frac{\pi}{6}(x-c)\right) + 80.6$

SLOPE

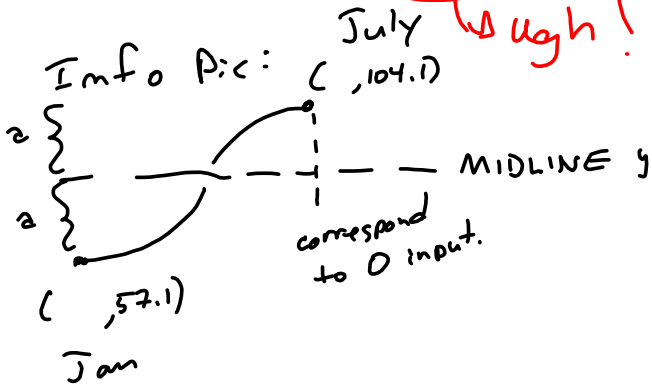
Last bit:

Make it "start" at its high point.

Month 7!

$g(x) = 23.5\cos\left(\frac{\pi}{6}(x-7)\right) + 80.6$

Info Pic:



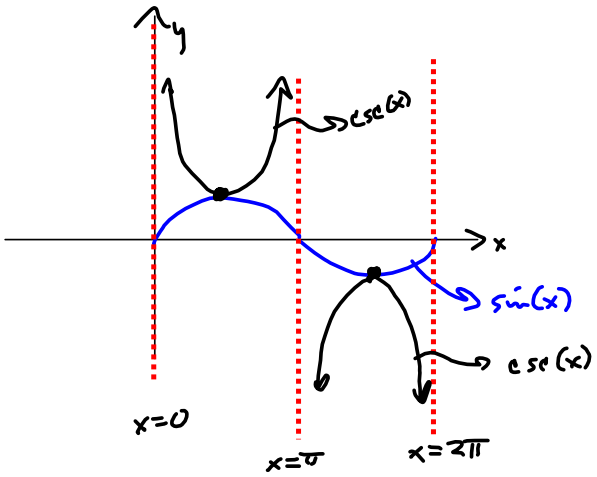
WebAssign is very picky about the form of your answer on these, but it's also very *arbitrary*.

What I want on written work.

Sven saw my mistake.

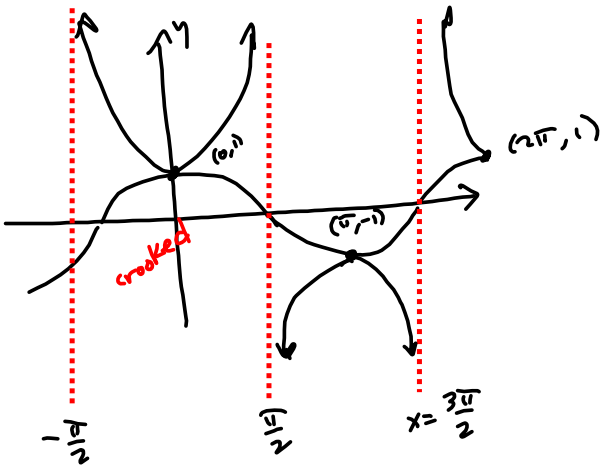
Didn't see him point it out until after I caught it, myself.

BOOTSTRAP FROM SINE & COSINE TO COSECANT & SECANT, Respectively



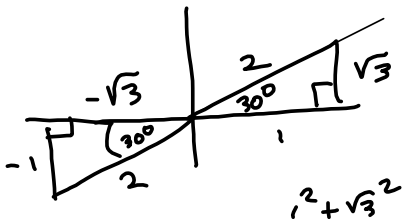
$$\csc\left(\frac{\pi}{2}\right) = \frac{1}{\sin\left(\frac{\pi}{2}\right)} = \frac{1}{1} = 1$$

Secant = $\frac{1}{\text{cosine}}$



Solving Equations (briefly)

$\tan(x) = \sqrt{3}$ **Find all solutions in** $[-2\pi, 2\pi]$



$1^2 + \sqrt{3}^2 = 1 + 3 = 4 = c^2$

$c = \pm 2 \rightsquigarrow c = 2$

$x = 30^\circ \rightsquigarrow \frac{\pi}{6}$

$x = 180^\circ + 30^\circ = 210^\circ = \frac{7\pi}{6}$

That's half of it.

We need solns in $[-2\pi, 0]$

$30^\circ - 360^\circ = -330^\circ = -\frac{11\pi}{6}$

$\frac{\pi}{6} - 2\pi = \frac{\pi - 12\pi}{6} = -\frac{11\pi}{6}$

$\frac{7\pi}{6} - \frac{12\pi}{6} = -\frac{5\pi}{6}$, so...

$x = -\frac{11\pi}{6}, -\frac{5\pi}{6}, \frac{\pi}{6}, \frac{7\pi}{6}$

FIND ALL Solns:

$\tan(x) = \sqrt{3} \Rightarrow$

$x = \frac{\pi}{6} + n\pi, \; n \in \mathbb{Z}$. (n is an integer)