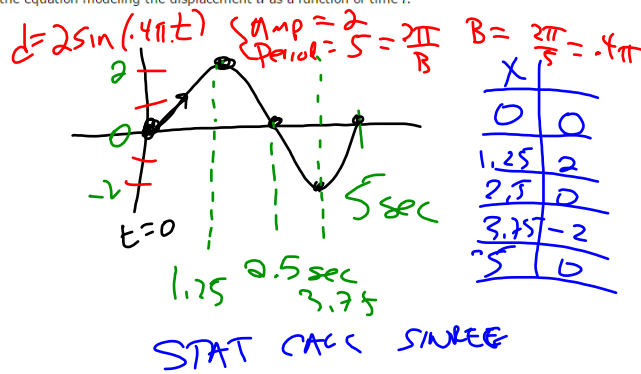


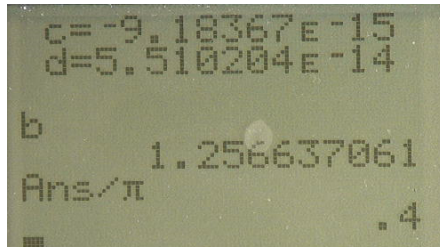
Word problem involving a sine or cosine function: Problem type 1

A buoy floating in the ocean is bobbing in simple harmonic motion with amplitude 2 ft and period 5 seconds. Its displacement d from sea level at time $t = 0$ seconds is 0 ft, and initially it moves upward. (Note that upward is the positive direction.)

Give the equation modeling the displacement d as a function of time t .

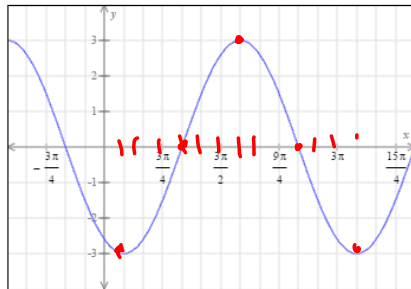


$a = 2$
 $b = 1.25 \dots \approx .4\pi$
 $c = -9.8 \dots \approx 0$
 $d = 0$



Writing the equation of a sine or cosine function given its graph: Problem type 2

Write the equation of a sine or cosine function to describe the graph.



with $\frac{\pi}{4}$

$(\frac{\pi}{4}, -3) (\frac{5\pi}{4}, 0) (\frac{9\pi}{4}, 3) (\frac{13\pi}{4}, 0) (\frac{17\pi}{4}, -3)$

Amp = 3 $A = 3$
 Period = $\frac{12\pi}{4} = 3\pi = \frac{2\pi}{B}$ $B = \frac{2}{3}$
 Phase Shift: $\pi = -\frac{c}{B}$

$-\frac{2}{3}\pi = c$

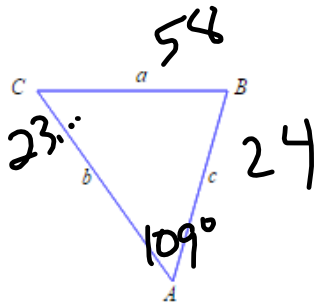
$y = 3 \sin\left(\frac{2}{3}x - \frac{2}{3}\pi\right)$

Solving a triangle with the law of sines: Problem type 2

Consider a triangle ABC like the one below. Suppose that $a = 58$, $c = 24$, and $A = 109^\circ$. (The figure is not drawn to scale.) Solve the triangle.

Carry your intermediate computations to at least four decimal places, and round your answers to the nearest tenth.

If no such triangle exists, enter "No solution." If there is more than one solution, use the "or" button.



$$\frac{58}{\sin 109^\circ} = \frac{24}{\sin C}$$

$$\sin^{-1}\left(\frac{24 \sin 109^\circ}{58}\right) = 23.0$$

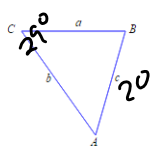
$$180 - 23 = 157$$

Solving a triangle with the law of sines: Problem type 2

Consider a triangle ABC like the one below. Suppose that $c = 20$, $a = 30$, and $C = 29^\circ$. (The figure is not drawn to scale.) Solve the triangle.

Carry your intermediate computations to at least four decimal places, and round your answers to the nearest tenth.

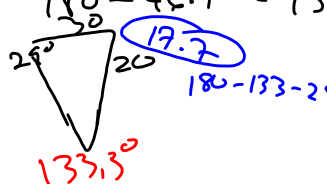
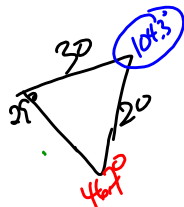
If no such triangle exists, enter "No solution." If there is more than one solution, use the "or" button.



$$\frac{20}{\sin 29^\circ} = \frac{30}{\sin A}$$

$$A = \sin^{-1}\left(\frac{\sin 29^\circ \cdot 30}{20}\right) = 46.7$$

$$A = \text{or } 180 - 46.7 = 133.3$$



$$b = \frac{20}{\sin 104.3^\circ} \sin 29^\circ$$

$$b = \frac{20 \sin 104.3^\circ}{\sin 29^\circ} = 40.0$$

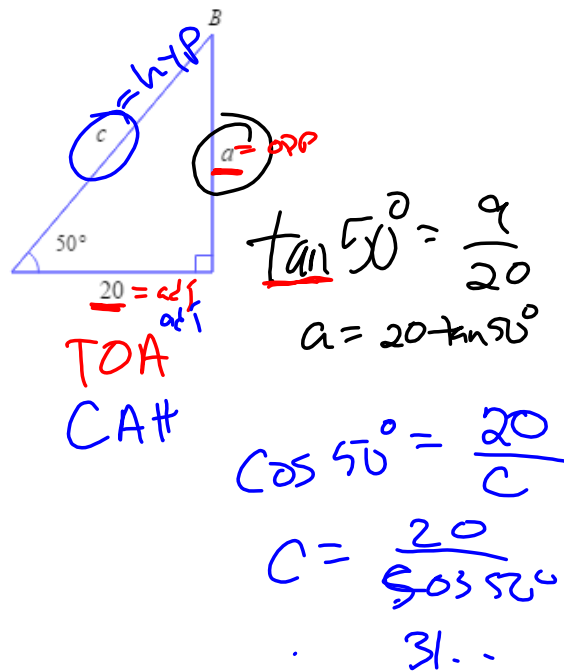
$$\frac{b}{\sin 17.7^\circ} = \frac{20}{\sin 29^\circ}$$

$$b = \frac{20 \sin 17.7^\circ}{\sin 29^\circ} = 12.5$$

Solving a right triangle

Solve the right triangle.

Round your answers to the nearest tenth.

**Half-angle identities: Problem type 1**Use a half-angle formula to find the exact value of $\sin 112.5^\circ$.

$$\sin\left(\frac{225^\circ}{2}\right)$$

$$\sin\left(\frac{225^\circ}{2}\right) = \pm \sqrt{\frac{1 - \cos 225^\circ}{2}}$$

$$\cos 225^\circ = -\frac{\sqrt{2}}{2} = -0.707\dots$$

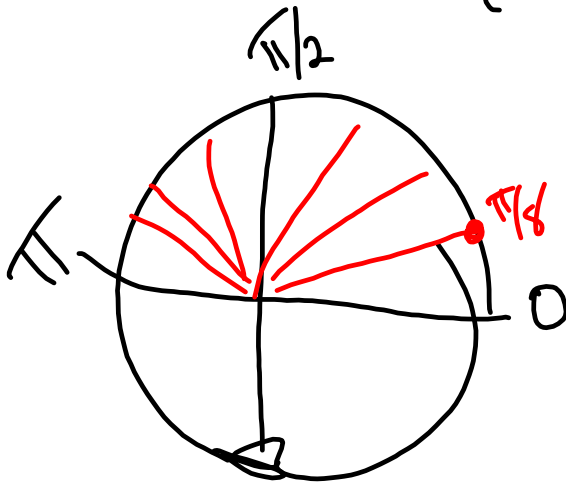
$$= \oplus \sqrt{\frac{1 - (-\sqrt{2}/2)}{2}}$$



$$\cos\left(\frac{\pi}{8}\right)$$

$$\cos\left(\frac{\frac{\pi}{4}}{2}\right) = \pm \sqrt{\frac{1 + \cos \pi/4}{2}}$$

$$= + \sqrt{\frac{1 + \sqrt{2}/2}{2}}$$



Amplitude, period, and phase shift of sine and cosine functions

Find the phase shift, period, and amplitude of the function.

$$y = -4 \cos(2\pi x - \pi) + 2 \rightarrow 2\pi x - \pi = 0$$

Give the exact values, not decimal approximations.

$$\text{Amplitude} = \frac{|A|}{1} = 4$$

$$\text{period} = \frac{2\pi}{b} = \frac{2\pi}{2\pi} = 1$$

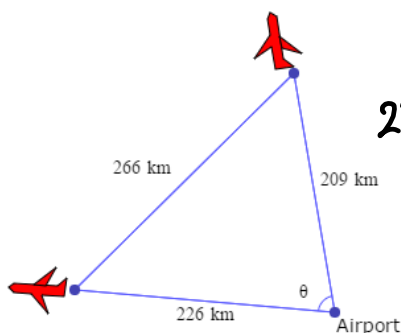
$$\text{phase shift} = -c/b = .5$$

$$2\pi x = \pi$$

$$x = \frac{1}{2}$$

11. Solving a word problem using the law of cosines

Two airplanes leave an airport at the same time. An hour later, the planes are 266km apart. If one plane has traveled 226km and the other has traveled 209km during the hour, find the angle θ between their flight paths. See the figure below.



$$266^2 = 209^2 + 226^2 - 2(209)(226)\cos\theta$$

$$\theta = \cos^{-1} \left(\frac{266^2 - 209^2 - 226^2}{-2(209)(226)} \right)$$

Carry your intermediate computations to at least four decimal places.
Round your answer to the nearest tenth of a degree.

$$\cos^{-1} \left(\frac{266^2 - 209^2 - 226^2}{-2 * 209 * 226} \right)$$

$$\cos^{-1} \left(\frac{266^2 - 209^2 - 226^2}{-2 * 209 * 226} \right) = 75.28181871$$

Midterm Fall 2015 - Question #7;

Using a **graphing calculator** to solve an exponential or logarithmic equation

Use the ALEKS **graphing calculator** to solve the equation.

$$e^{1-2x} = 4 - 2x$$

Round to the **nearest hundredth**.

If there is more than one solution, separate them with commas.

$$y1 = e^{(1-2x)}$$

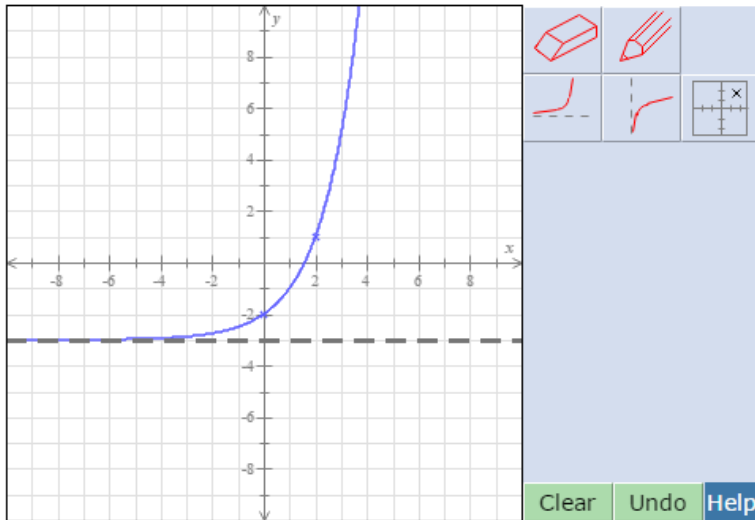
$$y2 = 4 - 2x$$

calc 5: enter enter enter

$$x = -.25$$

calc 5: enter enter >>6

$$x = 1.97..$$



Domain: $(-\infty, \infty)$

Range: $(-3, \infty)$

$($	$)$	$[$	$]$	$($	$,$	$)$	$[$	$,$	$]$
$[$	$]$	\emptyset	\cup	\cup	\cup	\cup	\cup	\cup	\cup
∞	$-\infty$								

Clear Undo Help

ALEKS: Prof. Porter - Google Chrome

https://www.aleks.com/alekscgi/x/isl.exe/1o_u-IgNsiKasNW8D8A9PVVR1RH3cOF-hAdNBzO-01V-hG98Uba7Tl

SMART Ink

CLASS TOOLS

Domain: $(0, \infty)$

Range: $(-\infty, \infty)$

Clear Undo Help

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$$\log_3 5 + \log_3 8 = \log_3 40$$

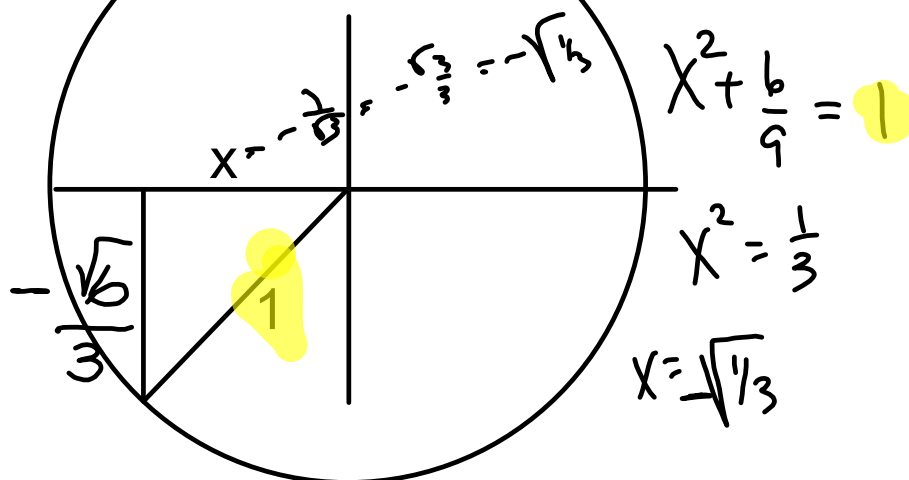
$$\log_8 5 - \log_8 3 = \log_8 \frac{5}{3}$$

$$\log_3 \frac{1}{32} = -5 \log_3 2$$

Midterm Fall 2015 - Question #15;
Finding a point on the unit circle given one coordinate

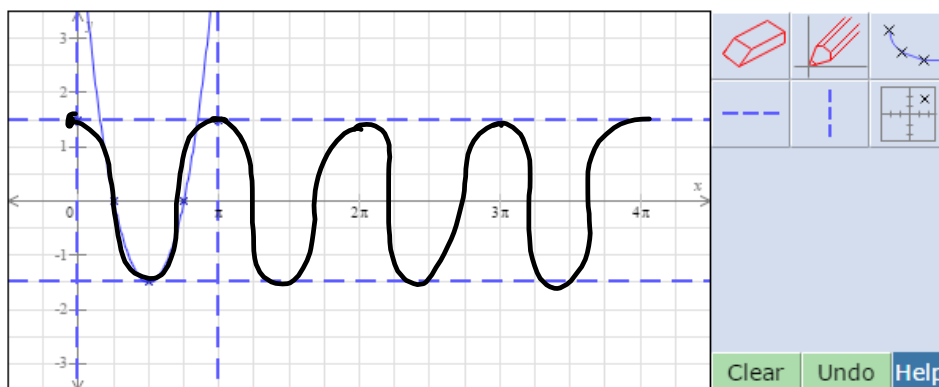
Suppose that $\left(x, -\frac{\sqrt{6}}{3}\right)$ is a point in quadrant III lying on the unit circle.

Find x . Write the exact value, not a decimal approximation.



Midterm Fall 2015 - Question #17;
Sketching the graph of a sine or cosine function: Problem type 2

Graph the function $y = \frac{3}{2} \cos 2x$.



Explain

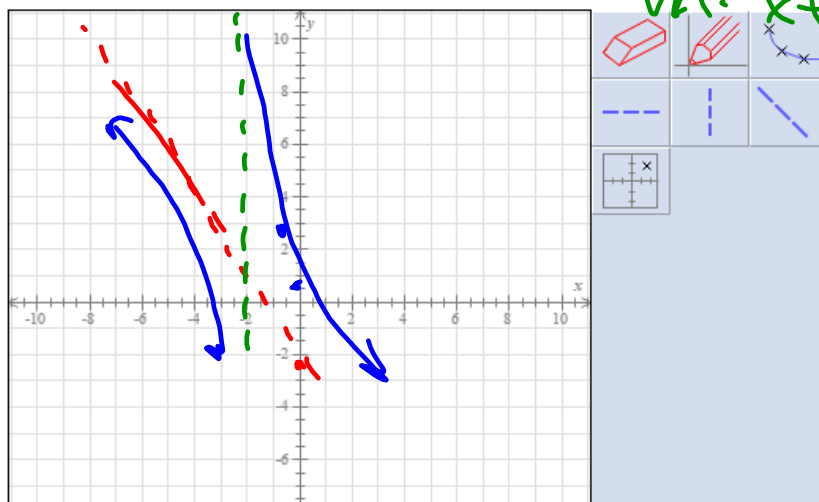
[CLOSE WINDOW](#)

Midterm Fall 2015 - Question #19;
Graphing a rational function: Quadratic over linear

Graph the rational function $f(x) = \frac{-2x^2 - 7x + 1}{x + 2}$.

$$\begin{array}{r}
 -2x - 3 \leftarrow \\
 \hline
 x+2 \sqrt{-2x^2 - 7x + 1} \quad \text{Sign} \\
 \underline{-(-2x^2 - 4x)} \\
 -3x
 \end{array}$$

To graph the function, draw the asymptotes (if any) and plot at least two points on each piece of the graph.



VA: $x + 2 = 0$
 $x = -2$

**Midterm Fall 2015 - Question #20;
Using a graphing calculator to solve a word problem involving a local extremum of a polynomial function**

A manufacturer cuts squares from the corners of a rectangular piece of sheet metal that measures 2 centimeters by 8 centimeters (see Figure 1). The manufacturer then folds the metal upward to make an open-topped box (see Figure 2). Letting x represent the side-lengths (in centimeters) of the squares, use the ALEKS graphing calculator to find the value of x that maximizes the volume enclosed by this box. Then give the maximum volume. Round your responses to two decimal places.

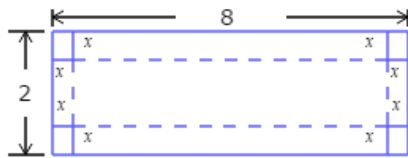


Figure 1



Figure 2

Given the 5 data points:

Zero of cubic regression

Max/min quadratic regression

Growth rate exp regression

Find all solutions to $\sin \text{reg} = \#$

(I may give you a period)

Faces in Quartic Regression

Asymptote for LN regression

Evaluate and solve linear