

Trigonometry

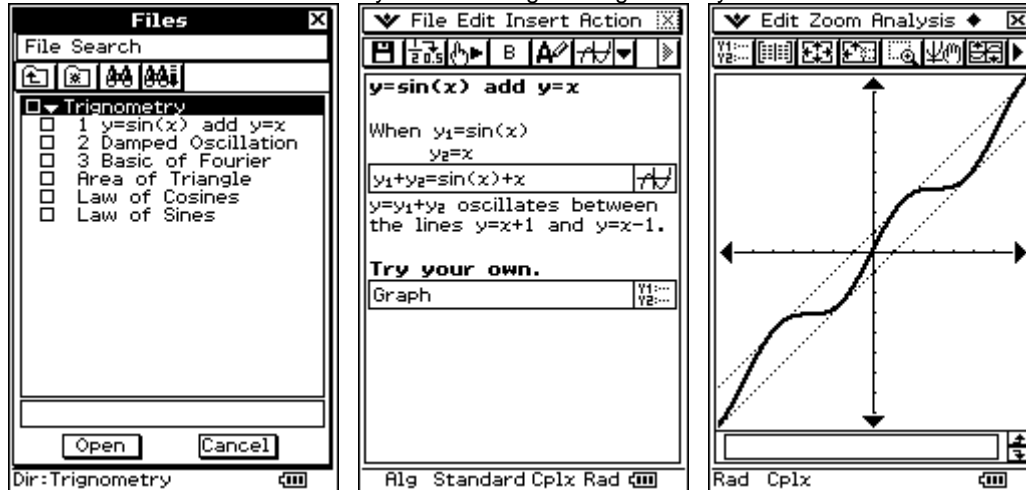
What happens when you combine trigonometry functions? What does the graph look like when you change the functions? And, do you know your trig laws? We included a few for use in your exploration of the unknown.

This file includes eActivities on:

- 1. $y=\sin(x)$ plus $y=x$** New looks for old trig functions.
 - 2. Damped Oscillation** Check out these functions. Does the graph make sense?
 - 3. Basics of Fourier** Looks complicated but don't let that stop you!
- Area of Triangles** Determine the area even if you don't have the lengths of all sides.
Law of Cosines Find the length of the mystery side,
Law of Sines Or find the length with this law.

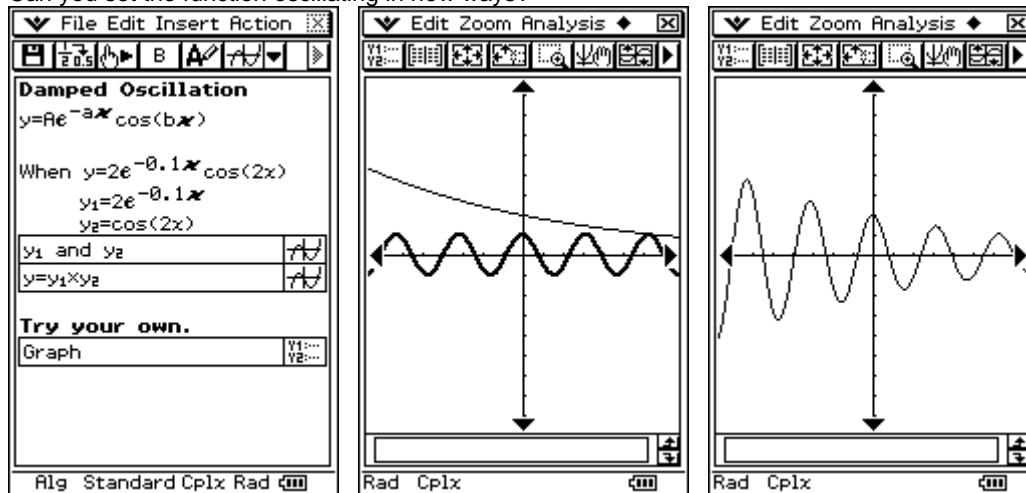
1. $y=\sin(x)$ plus $y=x$

See what addition looks like when you are dealing with trigonometry.



2. Damped Oscillation

Can you set the function oscillating in new ways?



3. Basics of Fourier

Watch what happens when you make a few changes with this fascinating formula.

Basic of Fourier

Definition

$$F(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} (a_n \cos(nx)) + \sum_{n=1}^{\infty} (b_n \sin(nx))$$

$$a_0 = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) dx$$

$$a_n = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \cos(nx) dx$$

$$b_n = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \sin(nx) dx$$

When the original function is $y=x$, and $n=1,2,3$.

Define $f(x)=x$ done

$\{1,2,3\} \Rightarrow n$ $\{1,2,3\}$

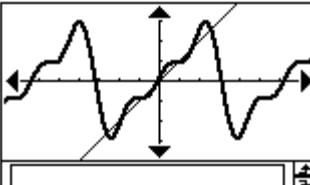
$$\frac{\cos(nx)}{\pi} \int_{-\pi}^{\pi} f(x) \cos(nx) dx$$

$\{2 \cdot \sin(x), -\sin(2 \cdot x), 2 \cdot \sin(x)\}$

$$2 \cdot \sin(x) + \frac{2 \cdot \sin(3 \cdot x)}{3} - \sin(2 \cdot x)$$

Graph of Fourier

Try to change the function and n to study the basic of fourier.



Area of Triangles

You don't have all the side's lengths but you need to know the area. Use this helpful formula.

Area of Triangle

$$\text{Area} = \frac{1}{2} bc \sin(A)$$

$$= \frac{1}{2} ac \sin(B)$$

$$= \frac{1}{2} ab \sin(C)$$

When $\triangle ABC$ has $a=10$, $b=4$ and $\angle C=35^\circ$.

$$\text{Area} = \frac{1}{2} ab \sin(C)$$

$$= \frac{1}{2} \cdot 10 \cdot 4 \cdot \sin(35^\circ)$$

$$= 11.47152873$$

$$= \frac{1}{2} ac \sin(B)$$

$$= \frac{1}{2} ab \sin(C)$$

When $\triangle ABC$ has $a=10$, $b=4$ and $\angle C=35^\circ$.

$$\text{Area} = \frac{1}{2} ab \sin(C)$$

$$= \frac{1}{2} \cdot 10 \cdot 4 \cdot \sin(35^\circ)$$

$$= 11.47152873$$

Try your own.

Calculator

Law of Cosines

Find the size of the triangle's unknown side.

Law of Cosines

$$a^2 = b^2 + c^2 - 2bc \cdot \cos(A)$$

$$b^2 = a^2 + c^2 - 2ac \cdot \cos(B)$$

$$c^2 = a^2 + b^2 - 2bc \cdot \cos(C)$$

When $\triangle ABC$ has $a=10$, $b=4$ and $\angle C=35^\circ$.

$$c^2 = a^2 + b^2 - 2bc \cdot \cos(C)$$

Substitute the numbers,

$$c^2 = 10^2 + 4^2 - 2 \cdot 10 \cdot 4 \cdot \cos(35^\circ)$$

$$c^2 = 50.46783646$$

$$c = 7.104071823$$

Try your own.

Calculator

$$a^2 = b^2 + c^2 - 2bc \cdot \cos(A)$$

$$b^2 = a^2 + c^2 - 2ac \cdot \cos(B)$$

$$c^2 = a^2 + b^2 - 2bc \cdot \cos(C)$$

When $\triangle ABC$ has $a=10$, $b=4$ and $\angle C=35^\circ$.

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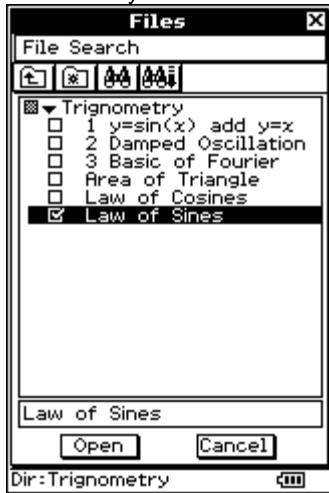
$$c = 7.104071823$$

Try your own.

Calculator

Law of Sines

Another way to discover the unknown.



A screenshot of a calculator window titled "File Edit Insert Action". The window has a menu bar and a toolbar. The main display area shows the title "Law of Sines" followed by the formula $\frac{\sin(A)}{a} = \frac{\sin(B)}{b} = \frac{\sin(C)}{c}$. Below the formula, it says "When $\triangle ABC$ has $\angle A=35^\circ$, $\angle B=45^\circ$ and $a=10$." The calculation shown is $\frac{\sin(35^\circ)}{10} = \frac{\sin(45^\circ)}{b}$, which is rearranged to $b = \frac{10\sin(45^\circ)}{\sin(35^\circ)}$ and the result is $=12.32803052$. Below the calculation, there is a section titled "Try your own." with a text field containing "Calculator" and a checkmark icon. The status bar at the bottom shows "Alg Standard Cplx Rad".