Good Morning!

I am not available for help day Tuesday as I won't be here.

I will pass back your exams and go through them.

I am not available Thursday as I have a meeting. I teach the HSA review session Wednesday (You can come do test corrections/take the quiz)

Schedule Update:
- Today: Double-Half Angle Formulas
- Next Class: Law of Sines (new info)
- Following Class: Quiz 6 Review (Sum & Difference, Double-Half)
- Quiz 6

Apr 22-9:56 AM

$\sin x = \frac{4}{5}$ $\sin 2x$ $\sin \frac{1}{2}x$

Objective: Students will be able to use the double and half angle identities to find the exact value of a trigonometric function.

Apr 22-10:00 AM

Why are we doing this?

Given sin(x), we can find cos(x) and tan(x).

Now we'll be able to find cos($2x$) or cos(($1/2$)x).

We can solve sin($2x$) = 0.

Now we'll be able to solve 2cos(x) + sin($2x$) = 0.

Real-Life Applications:

- Optics Fields in Physics and Biochemistry
- When you take Calculus in College or next year to solve integrals
- Architecture (bridges)
- Engineering
- Surveyors

Apr 22-10:01 AM

Double-Angle Formulas:

sin(A + B) = sin Acos B + cos Asin B
sin(A - B) = sin Acos B - cos Asin B

cos(A + B) = cos Acos B - sin Asin B
cos(A - B) = cos Acos B + sin Asin B

Let's derive these formulas using the sum and difference formulas:

sin $2x$ = $\sin(\overset{A}{x}+\overset{B}{x}) = \sin x\cos x + \cos x\sin x = \boxed{2\sin x\cos x}$

cos $2x$ = $\cos(\overset{A}{x}+\overset{B}{x})$

$= \cos x\cos x - \sin x\sin x$

$= \boxed{\cos^2 x - \sin^2 x}$

$(1-\sin^2 x) - \sin^2 x = \boxed{1-2\sin^2 x}$

$\cos^2 x - (1-\cos^2 x)$

$\cos^2 x - 1 + \cos^2 x = \boxed{2\cos^2 x - 1}$

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Steps to Find Exact Values of Trig. Functions using Double and Half Angle Identities

1. Draw a triangle in the correct quadrant using given information

2. Find the missing side using P.Thm.

3. Use the appropriate identity to find the angle

4. Simplify

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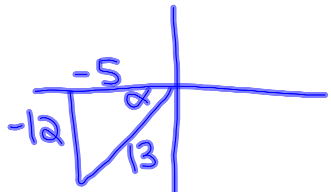
Example #1:

opp hyp 360 540 180

If $\sin\alpha = -12/13$ and $180^\circ < \alpha < 270^\circ$, find $\cos 2\alpha$



$a^2 + (-12)^2 = 13^2$

$a^2 + 144 = 169$

$\sqrt{a^2} = \sqrt{25}$

$a = 5$

$\cos 2\alpha = 1 - 2\sin^2\alpha$

$= 1 - 2\left(-\frac{12}{13}\right)^2$

$1 - \frac{2}{1}\left(\frac{144}{169}\right)$

$1 - \frac{288}{169}$

$\frac{169}{169} - \frac{288}{169}$

$= \boxed{\frac{-119}{169}}$

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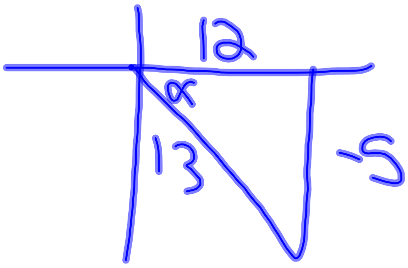
Example #2:

opp adj

If $\tan\alpha = -5/12$ and $270^\circ < \alpha < 360^\circ$, find $\sin 2\alpha$



$$\sin 2\alpha = 2\sin\alpha\cos\alpha$$

$$= \frac{2}{1}\left(-\frac{5}{13}\right)\left(\frac{12}{13}\right)$$

$$\boxed{\frac{-120}{169}}$$

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Half-Angle Identities:

you decide this

$$\sin\frac{1}{2}x = \pm\sqrt{\frac{1-\cos x}{2}}$$

$$\cos\frac{1}{2}x = \pm\sqrt{\frac{1+\cos x}{2}}$$

****The quadrant location determines the sign!****

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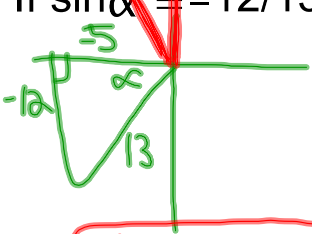
Example #3:

lives here

If $\sin\alpha = -12/13$ and $180^\circ < \alpha < 270^\circ$, find $\cos\frac{1}{2}\alpha$



$\frac{180}{2} < \frac{\alpha}{2} < \frac{270}{2}$

$90 < \alpha < 135$

$\cos\frac{1}{2}\alpha = -\sqrt{\frac{1+\cos\alpha}{2}}$

these are

$\sqrt{(1-\cos\alpha)\frac{1}{2}}$

$-\sqrt{\left(\frac{8}{13}\right)\frac{1}{2}}$

$-\sqrt{\frac{8}{26}} = \boxed{\sqrt{\frac{4}{13}}}$

$-\sqrt{\frac{1+\frac{-5}{13}}{2}}$

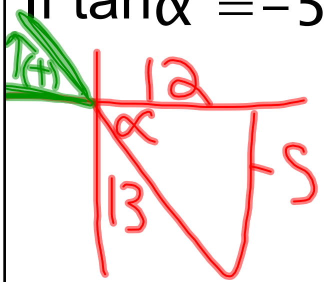
mean the same

$-\sqrt{\frac{\frac{8}{13}}{2}}$

Example #4:

If $\tan\alpha = -5/12$ and $270^\circ < \alpha < 360^\circ$, find $\sin\frac{1}{2}\alpha$

$135 < \alpha < 180$



$+\sqrt{\frac{1-\cos\alpha}{2}}$

$=\sqrt{\left(1-\frac{12}{13}\right)\frac{1}{2}}$

$\sqrt{\frac{1}{13}\cdot\frac{1}{2}} = \sqrt{\frac{1}{26}}$

Why can't we solve this like we used to?

What do we have to do instead?

$$\sin 2x + \cos x = 0$$

$$2\sin x\cos x + \cos x = 0$$

$$\cos x(2\sin x + 1) = 0$$

$\cos x = 0$

$\frac{\pi}{2} + 2\pi n$

$\frac{3\pi}{2} + 2\pi n$

$\sin x = -1/2$

$\frac{7\pi}{6} + 2\pi n$

$\frac{11\pi}{6} + 2\pi n$

After applying the double angle formula, the process for solving is the same as before!

Apr 22-10:29 AM