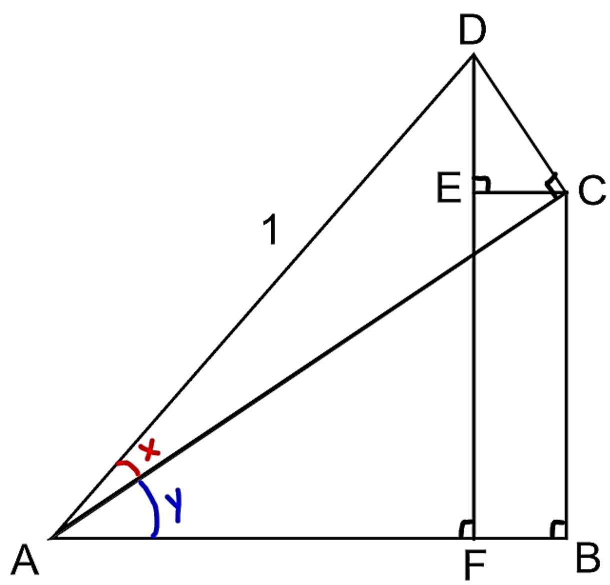
Name: ____ Per: _________

Proving the Cosine Sum Formula and Half-Angle Formulas

In the lesson, we used the figure below to prove the sine sum formula. You are going to now prove the cosine sum formula in a similar fashion.

Goal: Prove $\cos(x+y) = \cos(x)\cos(y) - \sin(x)\sin(y)$

Consider the figure we used for the sine sum formula.



Use the sine sum formula we did in class as a guide to prove the cosine sum formula.

I have done the left-hand side for you. Your job is to show it equals the right-hand side.

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

$$\overline{AF} = \cos(x)\cos(y) - \sin(x)\sin(y)$$

$$\overline{AB} - \overline{FB} = \cos(x)\cos(y) - \sin(x)\sin(y)$$

CONTINUE ON THE BACK SIDE

Goal: Prove the Half-Angle Formulas

In the lesson we proved the power-reducing formulas shown below.

$\sin^2 u = \frac{1-cos2u}{2}$ $\cos^2 u = \frac{1+cos2u}{2}$ $\tan^2 u = \frac{1-cos2u}{1+cos2u}$

1) Show how you can transform the power-reducing formulas to obtain what are known as the half-angle formulas shown below.

$$sin\frac{v}{2} = \pm\sqrt{\frac{1-cos\,v}{2}} \qquad cos\frac{v}{2} = \pm\sqrt{\frac{1+cos\,v}{2}}$$

2) Complete the steps below to transform the power reducing formula for tangent into a half-angle formula for tangent.

$$tan\frac{v}{2} = \frac{sin\frac{v}{2}}{cos\frac{v}{2}}$$

$$\tan\frac{v}{2} = \frac{\sqrt{\frac{1-cos\,v}{2}}}{\sqrt{\frac{1+cos\,v}{2}}}$$

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

$$\tan\frac{v}{2} = \sqrt{\frac{(1-\cos v)(1-\cos v)}{(1+\cos v)(1-\cos v)}}$$

$$\tan\frac{v}{2} = \sqrt{\frac{\qquad\qquad}{\qquad\qquad}}$$

$$\tan\frac{v}{2} = \sqrt{\frac{\qquad\qquad}{\qquad\qquad}}$$

$$\tan\frac{v}{2} = \frac{1-\cos v}{\sin v}$$