Section 5.5 – Multiple-Angle Formulas

Don't worry, you do not have to memorize the following formulas, but you have to know how to use them....

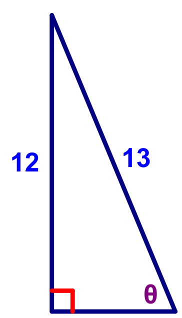
Double-Angle Formulas

$$\sin(2\theta) = 2\sin\theta\cos\theta$$

$$\cos(2\theta) = \cos^2\theta - \sin^2\theta$$
$$= 2\cos^2\theta - 1$$
$$= 1 - 2\sin^2\theta$$

$$\tan(2\theta) = \frac{2\tan\theta}{1-\tan^2\theta}$$

Ex. 1) Use the figure to find the <u>exact value</u> of the following:



sin 2θ =

cos 2θ =

tan 2θ =

Section 5.5 – Multiple-Angle Formulas

Ex. 2) Find the exact solution of the equation in the interval $[0, 2\pi)$

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

Ex. 3) Find the exact solution of the equation in the interval $[0, 2\pi)$

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

Ex. 4) Use a double-angle formula to <u>rewrite</u> the expression.

$$6\cos^2 x - 3$$

Ex. 5) Find the exact value of the following if $\csc x = 3$, and $\frac{\pi}{2} < x < \pi$

$$\tan 2x =$$

Section 5.5 – Multiple-Angle Formulas

****The signs of $\sin\frac{\theta}{2}$ and $\cos\frac{\theta}{2}$ depend on the quadrant in which $\frac{\theta}{2}$ lies****

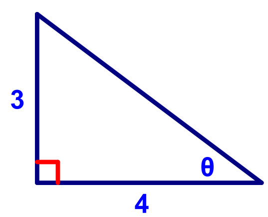
Half-Angle Formulas

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

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

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

Ex. 6) Use the figure to find the exact value of the following:



$\sin\frac{\theta}{2} =$

$\tan\frac{\theta}{2} =$

Ex. 7) Find the exact value of $\tan\frac{u}{2}$ if $\sin u = \frac{5}{13}$ and $\frac{\pi}{2} < u < \pi$.

Section 5.5 – Multiple-Angle Formulas

Ex. 8) Use the half-angle formulas to determine the exact values of:

a) $\sin\left(22.5°\right)$

b) $\cos 105°$

Ex. 9) Use the half-angle formulas to simplify the expression.

$$\frac{1-\cos 8x}{\sin 8x}$$

HW: 5.5 p.415: 3, 5, 9, 13, 19, 21, 27, 35, 37, 41, 53, 55