Cross-Topic Question:

What is the period and amplitude of $y = k\cos^2 x - k\sin^2 x$

	Amp	Period
a.	k	2π
b.	k	$\frac{2\pi}{k}$
c.	k	π
d.	$\frac{k}{2}$	$\frac{2\pi}{k}$

$y = K\cos(2x)$

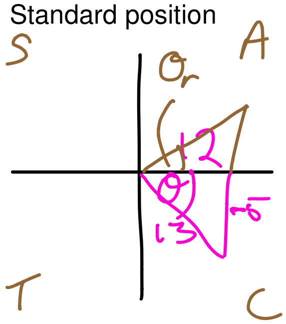
a

$p = \frac{2\pi}{2}$

$= \pi$

Problems:

If $\sin\theta = -\frac{5}{13}$ and $\frac{3\pi}{2} < \theta < 2\pi$ find the exact value of:

a. Draw the angle in Standard position	Find the exact value of: $\sin 2\theta$	Find the exact value of: $\tan 2\theta$	Find the exact value of: $\cos 2\theta$
	$= 2\sin\theta\cos\theta$ $= 2\left(\frac{-5}{13}\right)\left(\frac{12}{13}\right)$ $= -\frac{120}{169}$	$= \frac{2\tan}{1-\tan^2}$ $= \frac{2\left(\frac{-5}{12}\right)}{1-\left(\frac{-5}{12}\right)^2}$ $= -\frac{120}{119}$	$= \cos^2 - \sin^2$ $= \left(\frac{12}{13}\right)^2 - \left(\frac{-5}{13}\right)^2$ $= \frac{119}{169}$

In Calculus (which is really why this whole unit exists ☺) we will also write our $\cos 2\theta$ identities in terms of sine or cosine.

Solve for $\cos^2\theta$: $\cos 2\theta = 2\cos^2\theta - 1$	Solve for $\sin^2\theta$: $\cos 2\theta = 1 - 2\sin^2\theta$
$\cos^2\theta = \frac{\cos(2\theta)+1}{2}$	$\sin^2\theta = \frac{1-\cos(2\theta)}{2}$

Find an expression that is equivalent to $\sin(\pi - 2x)$

$= \sin\theta\cos\phi - \cos\theta\sin\phi$

$= \sin\pi\cos(2x) - \cos\pi\sin(2x)$

$= 0 - (-1)\sin(2x)$

$= \sin(2x)$

Verify: $2\sin^3 x - \sin x = -\cos(2x)$

LEFT SIDE	RIGHT SIDE
$= \sin(2\sin^2 - 1)$	$-\cos(2x)$
$= -\sin(1 - 2\sin^2)$	
$= -\sin(\cos(2x))$	

when is this true?

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

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

$= 0$

$= 0$

$1 - \sin(x) = 0$

$\sin(x) = 1$

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

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

$x = \frac{\pi}{4} + \frac{n\pi}{2}$

check @ $\frac{\pi}{2}$

LHS	RHS
$= 2 - 1$	$-(-1)$
$= 1$	$= 1$

$\frac{\pi}{4} \leq \theta \leq \frac{3\pi}{4}$

Prove: $\dfrac{\tan x}{\sec x + 1} = \dfrac{2\cos x - 2\cos^2 x}{\sin 2x}$

LEFT SIDE	RIGHT SIDE
	$= \dfrac{\cancel{2}\cancel{\cos}(1 - \cos)}{\cancel{2}\sin x \cancel{\cos x}}$
	$= \dfrac{1 - \cos}{\sin}$
	$= \dfrac{1 - \frac{1}{\sec}}{\sin}$
	$= \dfrac{\frac{\sec - 1}{\sec}}{\sin} = \dfrac{(\sec - 1)\cos}{\sin}$
	$= \dfrac{\sec - 1}{\tan}\left(\dfrac{\sec + 1}{\sec + 1}\right)$

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

$$= \frac{\tan^{\cancel{2}}}{\cancel{\tan}(\sec + 1)}$$

$$= \frac{\tan}{\sec + 1}$$