Day 6: Double Angle Identities

Origin of the double angle identity:

$\sin(2\theta)$

$\sin(\theta + \theta)$

$\sin\theta \cdot \cos\theta + \cos\theta \cdot \sin\theta$

$2\sin\theta \cos\theta$

$\cos(2\theta)$

$\cos(\theta + \theta)$

$\cos\theta \cdot \cos\theta - \sin\theta \sin\theta$

$\cos^2\theta - \sin^2\theta$

1) Write the following as single trig functions

a. $2\sin 0.6 \cos 0.6$

$= \sin(2A)$

$= \sin(2(0.6))$

$= \sin(1.2)$

b. $\cos^2 7 - \sin^2 7$

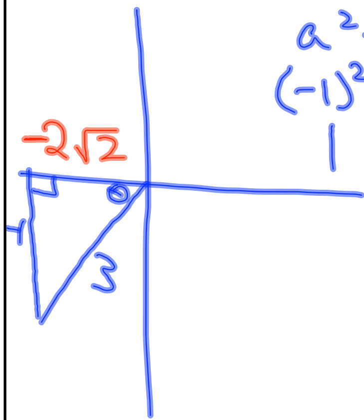
$= \cos(2A)$

$= \cos(2(7))$

$= \cos(14)$

2) If $\sin\theta = \frac{-1}{3}$ and is in the third quadrant, evaluate $\sin 2\theta$ *and* $\cos 2\theta$.

$\sin\theta = \frac{o}{h}$



$a^2 + b^2 = c^2$

$(-1)^2 + b^2 = 3^2$

$1 + b^2 = 9$

$b^2 = 8$

$b = \sqrt{8}$

$b = \sqrt{4}\cdot\sqrt{2}$

$b = 2\sqrt{2}$

$\sin 2A = 2\sin A\cos A$

$= 2\cdot\left(\frac{-1}{3}\right)\left(\frac{-2\sqrt{2}}{3}\right)$

$\sin 2A = \frac{4\sqrt{2}}{9}$

$\cos 2A = \cos^2 A - \sin^2 A$

$= \left(\frac{-2\sqrt{2}}{3}\right)^2 - \left(\frac{-1}{3}\right)^2$

$= \frac{4\cdot 2}{9} - \frac{1}{9}$

$= 7/9$

3) Prove each of the following algebraically and graphically.

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

$$(2\sin x\cos x) \div (1-(\cos^2 x - \sin^2 x)) = \cot x$$

$$(2\sin x\cos x) \div (1-\cos^2 x + \sin^2 x) = \cot x$$

$$(2\sin x\cos x) \div (\sin^2 x + \sin^2 x) = \cot x$$

$$\frac{\cancel{2}\,\cancel{\sin x}\cos x}{\cancel{2}\sin^{\cancel{2}} x} = \frac{\cos x}{\sin x}$$

$$\frac{\cos x}{\sin x} = \frac{\cos x}{\sin x}$$

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

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

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

$$= \frac{\sin^2\theta + \sin^2\theta}{\cos^2\theta + \cos^2\theta}$$

$$= \frac{\cancel{2}\sin^2\theta}{\cancel{2}\cos^2\theta}$$

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

$\sin^2 x + \cos^2 x = 1$

$\sin^2 x = \underline{1 - \cos^2 x}$

Assignment:

Pg. 342 1 odds, 6, 10, 13, 16

odds