Double Angle Identities

ex. If $\sin\theta = \frac{2}{3}$ $\frac{y}{r}$ determine $\sin(2\theta)$ α if θ is in quad 1

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

$$x^2 = r^2 - y^2$$
$$= 3^2 - 2^2$$
$$x = \sqrt{5}$$

$$= 2\left(\frac{2}{3}\right)\left(\frac{\sqrt{5}}{3}\right)$$

$$= \frac{4\sqrt{5}}{9}$$

Q4

ex. If $\tan\theta = -\frac{2}{3}$ $\frac{y}{x}$ over $\left(\frac{3\pi}{2}, 2\pi\right)$, determine $\cos(2\theta)$

$$3^2 + (-2)^2 = r^2$$
$$9 + 4 = r^2$$
$$r = \pm\sqrt{13}$$

$$\cos(2\theta) = 2\cos^2\theta - 1$$
$$= 2\left(\frac{3}{\sqrt{13}}\right)^2 - 1$$
$$= 2\left(\frac{9}{13}\right) - 1$$
$$= \frac{18}{13} - \frac{13}{13}$$
$$= \frac{5}{13}$$

Prove the identity below for all permissible values of θ:

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

LHS	RHS
$\frac{1-\tan^2\theta}{\sec^2\theta}$	$\cos^2\theta - \sin^2\theta$
$\frac{1}{\sec^2\theta} - \frac{\tan^2\theta}{\sec^2\theta}$	
$\cos^2\theta - \frac{\frac{\sin^2\theta}{\cancel{\cos^2\theta}}}{\frac{1}{\cancel{\cos^2\theta}}}$	
$\cos^2\theta - \sin^2\theta$	

$\therefore \square$