MHF4U Date: _____

7.3 Double Angle Formulas

Using the compound angle formulas you learned from 7.2, develop a formula for each of the following:

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

$\tan(2\theta)$

Double Angle Formulas

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

$$\begin{aligned}\cos(2\theta) &= \cos^2\theta - \sin^2\theta \\ &= 1 - 2\sin^2\theta \\ &= 2\cos^2\theta - 1\end{aligned}$$

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

Ex. 1 Express each of the following as a single trigonometric function.

a) $2\sin 3x\cos 3x$

b) $\frac{2\tan\left(\frac{y}{2}\right)}{1-\tan^2\left(\frac{y}{2}\right)}$

c) $2\cos^2(6x) - 1$

d) $5 - 10\sin^2\left(\frac{x}{3}\right)$

Ex. 2 Use a double angle formula to rewrite each trigonometric ratio.

a) $\sin(4\theta)$ b) $\cos(5\theta)$ c) $\tan\left(\frac{\theta}{2}\right)$

Ex. 3 Determine the exact value of each expression.

a) $2\cos\left(\frac{\pi}{12}\right)\sin\left(\frac{\pi}{12}\right)$ b) $1-2\sin^2\left(\frac{5\pi}{8}\right)$

Ex. 4 Determine the exact value of each expression.

a) Suppose $\cos\theta = \frac{5}{\sqrt{22}}, \frac{3\pi}{2} < \theta < 2\pi$, determine $\sin(2\theta)$

b) Suppose $\tan\theta = \frac{4}{7}, \pi < \theta < \frac{3\pi}{2}$, determine $\cos(2\theta)$

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