WARMUP

Establish the identity: $\sin(2\theta) = 2\sin\theta\cos\theta$

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

$\sin(\alpha+\beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$

Section 6.5 Part 1 - Double Angle Formulas

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

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

ex: $\sin\theta = -\frac{\sqrt{3}}{3}$ $\begin{matrix}\leftarrow y\\ \leftarrow r\end{matrix}$ $\quad \overbrace{\frac{3\pi}{2} < \theta < 2\pi}^{QIV}$

$x = \sqrt{6}$, $y = -\sqrt{3}$, $r = 3$

$$x^2 + (-\sqrt{3})^2 = 3^2$$
$$x^2 + 3 = 9$$
$$x^2 = 6$$
$$x = \sqrt{6}$$

so $\cos\theta = \frac{\sqrt{6}}{3}$

$$\sin(2\theta) = 2\sin\theta\cos\theta$$
$$= 2\left(-\frac{\sqrt{3}}{3}\right)\left(\frac{\sqrt{6}}{3}\right)$$
$$= \frac{-2\sqrt{18}}{9} = \frac{-2\cdot\cancel{3}\sqrt{2}}{\cancel{9}\,3}$$

18, $\sqrt{2}$, 9, 3 3

$= -\frac{2\sqrt{2}}{3}$

$\cos(2\theta) = \cos^2\theta - \sin^2\theta = \left(\frac{\sqrt{6}}{3}\right)^2 - \left(-\frac{\sqrt{3}}{3}\right)^2$

$= \frac{6}{9} - \frac{3}{9} = \frac{3}{9} = \frac{1}{3}$

ex: $\csc(2\theta) = \frac{1}{2}\sec\theta\csc\theta$

$$\csc(2\theta) = \frac{1}{\sin(2\theta)}$$
$$= \frac{1}{2\sin\theta\cos\theta}$$
$$= \frac{1}{2}\cdot\frac{1}{\sin\theta}\cdot\frac{1}{\cos\theta}$$
$$= \frac{1}{2}\csc\theta\cdot\sec\theta$$
$$= \frac{1}{2}\sec\theta\cdot\csc\theta$$

$$\frac{1}{2}\sec\theta\csc\theta = \frac{1}{2}\cdot\frac{1}{\cos\theta}\cdot\frac{1}{\sin\theta}$$
$$= \frac{1}{2\cos\theta\sin\theta}$$
$$= \frac{1}{2\sin\theta\cos\theta}$$
$$= \frac{1}{\sin(2\theta)}$$
$$= \csc(2\theta)$$

$$\csc\theta = \frac{1}{\sin\theta}$$

p501-502 1a, b, 3a, b, 5a, b, 7a, b, 33, 34