Problem 1

Find the exact value: $2\cos^2(165°) - 1$

$$2\cos^2(165°) - 1 = \cos(2(165°))$$

$$= \cos(330°)$$

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

Problem 2

Use the half angle identity to find: $\sin(\frac{\pi}{8})$

$$\sin\left(\frac{\pi}{8}\right) = \sin\left(\frac{\frac{\pi}{4}}{2}\right)$$

$$= \pm\sqrt{\frac{1-\cos(\frac{\pi}{4})}{2}}$$

$$= \sqrt{\frac{1-\frac{\sqrt{2}}{2}}{2} \cdot \frac{2}{2}}$$

$$= \sqrt{\frac{2-\sqrt{2}}{4}}$$

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

Note, since $\frac{\pi}{8}$ is in Q1 we only want the positive answer.

Problem 3

Find the exact value: $1 - 2\sin^2(15°)$

$$1 - 2\sin^2(15°) = \cos(2(15°))$$

$$\cos(30°)$$

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

Problem 4

Use power reducing formulas to find: $\sin^2(x) \cdot \cos^2(x)$

$$\sin^2(x) \cdot \cos^2(x) = \left(\frac{1-\cos(2x)}{2}\right)\left(\frac{1+\cos(2x)}{2}\right)$$
$$= \frac{1+\cos(2x)-\cos(2x)-\cos^2(2x)}{4}$$
$$= \frac{1}{4}(1-\cos^2(2x))$$
$$= \frac{1}{4}(1-\left(\frac{1+\cos(4x)}{2}\right))$$
$$= \frac{1}{4}(1-\frac{1}{2}-\frac{\cos(4x)}{2})$$
$$= \frac{1}{8}-\frac{\cos(4x)}{8}$$
$$= \frac{1-\cos(4x)}{8}$$

Problem 5

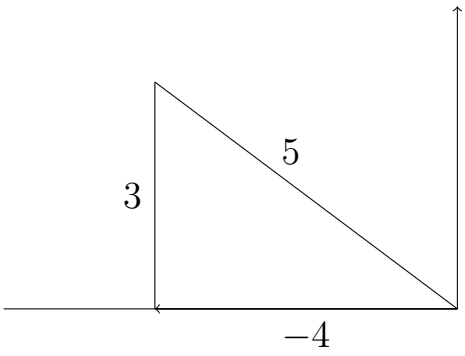
Find $\tan(\frac{7\pi}{8})$

$$\tan(\frac{7\pi}{8}) = \tan(\frac{\frac{7\pi}{4}}{2})$$
$$= \frac{1-\cos(\frac{7\pi}{4})}{\sin(\frac{7\pi}{4})}$$
$$= \frac{1-\frac{\sqrt{2}}{2}}{-\frac{\sqrt{2}}{2}} \cdot \frac{2}{2}$$
$$= \frac{2-\sqrt{2}}{-\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{2\sqrt{2}-2}{-2}$$
$$= 1-\sqrt{2}$$

Problem 6

Given $\sin(\theta) = \frac{3}{5}$, in Q2, find $\sin(2\theta), \cos(2\theta)$, and $\tan(2\theta)$

Graph of θ



$$\sin(2\theta) = 2\sin(\theta)\cos(\theta)$$
$$= 2\left(\frac{3}{5}\right)\left(\frac{-4}{5}\right)$$
$$= \frac{-24}{25}$$

$$\cos(2\theta) = \cos^2(\theta) - \sin^2(\theta)$$
$$\left(\frac{-4}{5}\right)^2 - \left(\frac{-3}{5}\right)^2$$
$$= \frac{16}{25} - \frac{9}{25}$$
$$= \frac{7}{25}$$

$$\tan(2\theta) = \frac{2\tan(\theta)}{1 - \tan^2(\theta)}$$
$$\frac{2(\frac{3}{-4})}{1 - (\frac{3}{-4})^2} = \frac{-\frac{6}{4}}{1 - \frac{9}{16}}$$
$$\frac{-\frac{3}{2}}{\frac{7}{16}} = -\frac{3}{2} \cdot \frac{16}{7} = \frac{-48}{14}$$
$$= \frac{-24}{7}$$