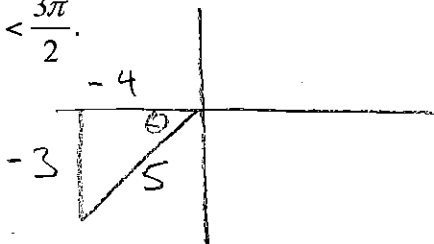


Draw a triangle, then use Double Angle formulas to find each value.

1) Given: $\tan \theta = \frac{3}{4}; \pi \leq \theta < \frac{3\pi}{2}$.



Double Angle Formulas

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

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

$$= 2 \cos^2 \theta - 1$$

$$= 1 - 2 \sin^2 \theta$$

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

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

$$= 2 \left(-\frac{3}{5} \right) \left(-\frac{4}{5} \right)$$

$$= \frac{24}{25}$$

b) $\cos(2\theta) = 2 \cos^2 \theta - 1$

$$= 2 \left(\frac{4}{5} \right) \left(\frac{4}{5} \right) - 1$$

$$= 2 \left(\frac{16}{25} \right) - 1$$

$$= \frac{32}{25} - 1$$

$$= \frac{7}{25}$$

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

$$= \frac{2 \left(\frac{3}{4} \right)}{1 - \left(\frac{3}{4} \right)^2}$$

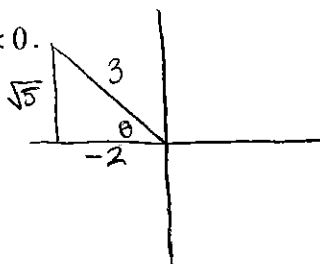
$$= \frac{\frac{3}{2}}{1 - \frac{9}{16}}$$

$$= \frac{\frac{3}{2}}{\frac{7}{16}} = \frac{3}{2} \cdot \frac{16}{7}$$

$$= \frac{48}{14}$$

$$= \frac{24}{7}$$

2) Given: $\cos \theta = -\frac{2}{3}; \tan \theta < 0$.



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

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

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

b) $\cos(2\theta) = 2 \cos^2 \theta - 1$

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

$$= \frac{8}{9} - 1$$

$$= \frac{8}{9} - \frac{9}{9}$$

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

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

$$= \frac{2 \left(-\frac{\sqrt{5}}{2} \right)}{1 - \left(-\frac{\sqrt{5}}{2} \right)^2}$$

$$= \frac{-\sqrt{5}}{1 - \frac{5}{4}}$$

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

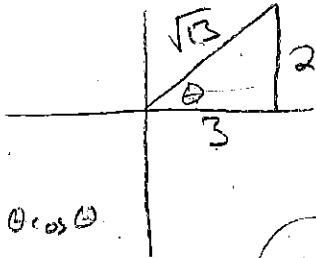
$$= \frac{-\sqrt{5}}{-1}$$

$$= \frac{-\sqrt{5}}{-1}$$

$$= \sqrt{5}$$

Find each of the following.

3) $\sin(2 \tan^{-1} \frac{2}{3})$



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

$$= 2 \left(\frac{2}{\sqrt{13}} \right) \left(\frac{3}{\sqrt{13}} \right) = \left(\frac{12}{13} \right)$$

4) $\cos(2 \sin^{-1} \frac{5}{13})$

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

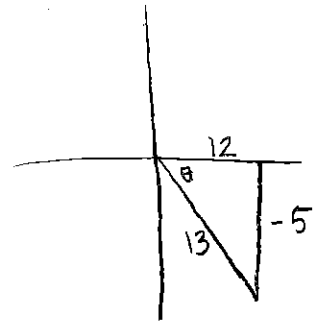
$$= 2 \left(\frac{12}{13} \right)^2 - 1$$

$$= 2 \left(\frac{144}{169} \right) - 1$$

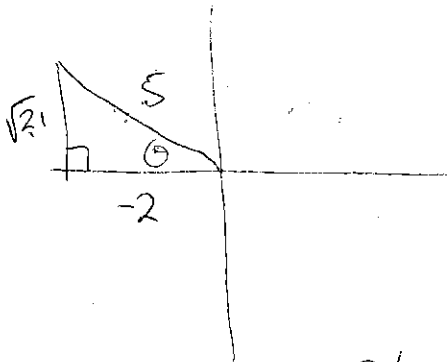
$$= \frac{288}{169} - 1$$

$$= \frac{288}{169} - \frac{169}{169}$$

$$= \frac{119}{169}$$



5) $\tan(2 \cos^{-1} \frac{2}{5})$



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

$$= \frac{2 \left(\frac{\sqrt{21}}{-2} \right)}{1 - \left(\frac{\sqrt{21}}{-2} \right)^2}$$

$$= \frac{-\sqrt{21}}{1 - \frac{21}{4}}$$

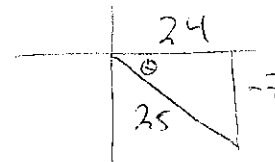
$$= \frac{-\sqrt{21}}{\frac{4}{4} - \frac{21}{4}}$$

$$= \frac{-\sqrt{21}}{\frac{-17}{4}} = -\sqrt{21} \cdot \frac{4}{-17} = \frac{4\sqrt{21}}{17}$$

$$\frac{4\sqrt{21}}{17}$$

6) $\cos(2 \sin^{-1} \frac{7}{25}) = \cos(2\theta) = 2 \cos^2 \theta - 1$

$$= 2 \left(\frac{24}{25} \right)^2 - 1$$



$$= 2 \left(\frac{576}{625} \right) - 1$$

$$= \frac{1152}{625} - \frac{625}{625}$$

$$= \frac{527}{625}$$