

Math 112: #20 A/B/C/D

A) Use a double angle formula and a right triangle to compute:

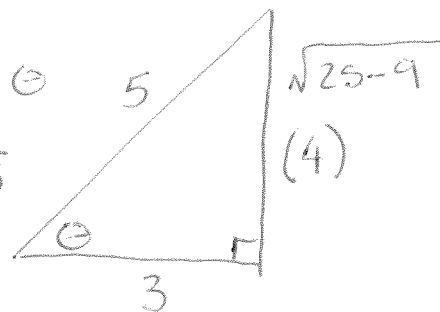
$$\sin\left(2\cos^{-1}\frac{3}{5}\right)$$

$$\begin{aligned}\sin 2\theta &= 2\sin\theta\cos\theta \\ &= 2\left(\frac{4}{5}\right)\left(\frac{3}{5}\right) = 2\left(\frac{12}{25}\right)\end{aligned}$$

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

$$\cos^{-1}\left(\frac{3}{5}\right) = \theta$$

$$\cos\theta = \frac{3}{5}$$



$$\sin\theta = \frac{4}{5}$$

B) Use a double angle formula and a right triangle to compute:

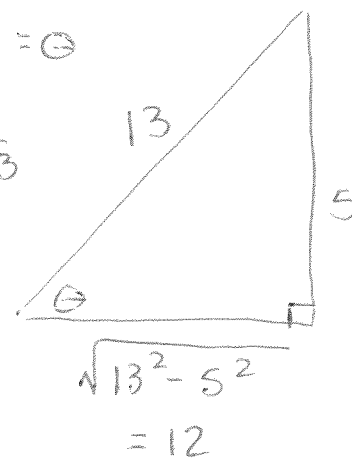
$$\cos\left(2\sin^{-1}\frac{5}{13}\right)$$

$$\begin{aligned}\cos 2\theta &= \cos^2\theta - \sin^2\theta \\ &= \left(\frac{12}{13}\right)^2 - \left(\frac{5}{13}\right)^2 \\ &= \frac{144}{169} - \frac{25}{169}\end{aligned}$$

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

$$\sin^{-1}\left(\frac{5}{13}\right) = \theta$$

$$\sin\theta = \frac{5}{13}$$



$$\cos\theta = \frac{12}{13}$$

C) Use a double angle formula and a right triangle to compute:

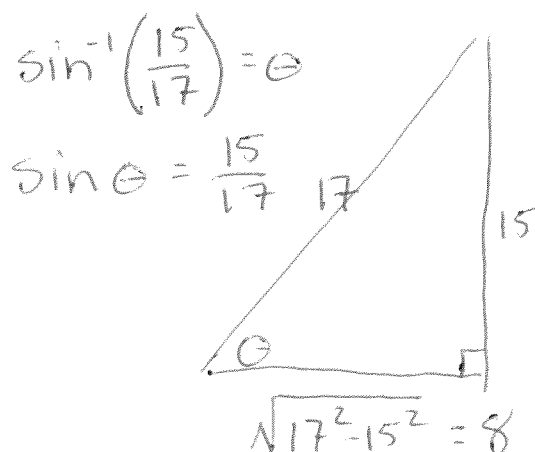
$$\tan\left(2\sin^{-1}\frac{15}{17}\right)$$

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

$$= \frac{2\left(\frac{15}{8}\right)}{1-\left(\frac{15}{8}\right)^2}$$

$$= \frac{\frac{30}{8}}{1-\frac{225}{64}} = \frac{\frac{30}{8}}{-\frac{161}{64}} \cdot \frac{64}{64}$$

$$= \frac{-240}{161}$$



$\tan\theta = \frac{15}{8}$

B) Use a double angle formula and a right triangle to compute:

$$\cos\left(2\tan^{-1}\frac{21}{20}\right)$$

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

$$= \left(\frac{20}{29}\right)^2 - \left(\frac{21}{29}\right)^2$$

$$= \frac{400}{841} - \frac{441}{841}$$

$$= \frac{-41}{841}$$

