1) $3\sin^2 x + \cancel{2\cos} \cos 2x - 2 = 0$ $\qquad \cos 2x = 1 - 2\sin^2 x$

$\boxed{\text{Solve: } 3\sin^2 x + \cos 2x - 2 = 0}$

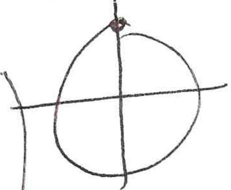
$3\sin^2 x + 1 - 2\sin^2 x - 2 = 0$

$\sin^2 x - 1 = 0$

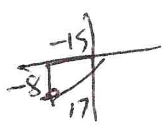
$(\sin x + 1) = 0 \qquad \sin x - 1 = 0$

$\sin x = -1 \qquad \sin x = 1$

$\boxed{\frac{\pi}{2} + \pi n}$



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



$\cos\theta = \frac{-15}{17}$

$\sin\theta = \frac{-8}{17}$

$\boxed{\tan\theta = \frac{8}{15} \quad \pi < \theta < \frac{3\pi}{2} \quad \text{find } \sin 2\theta, \ \cos 2\theta, \ \tan 2\theta}$

$\sin 2\theta = 2\sin\theta\cos\theta$

$= 2 \cdot \frac{-15}{17} \cdot \frac{-8}{17}$

$\frac{240}{289}$

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

$\left(\frac{-15}{17}\right)^2 - \left(\frac{-8}{17}\right)^2$

$\frac{225-64}{289} = \frac{161}{289}$

$\tan 2\theta = \dfrac{\frac{240}{289}}{\frac{161}{289}} = \frac{240}{161}$

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

$\boxed{\text{Rewrite } \sin^2 x \cdot \cos^2 x \text{ in terms of first powers of cosines of multiple angles}}$

$\frac{(1-\cos 2x)}{2} \cdot \frac{(1+\cos 2x)}{2}$

$\frac{1-\cos^2(2x)}{4}$

$\dfrac{1 - \left(\frac{1+\cos 2(2x)}{2}\right)}{4}$

$\dfrac{1 - \frac{1}{2} + \frac{1}{2}\cos 4x}{4}$

$\frac{1}{4}\left(\frac{1}{2} + \frac{1}{2}\cos 4x\right)$

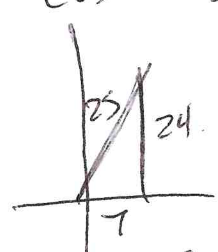
$\frac{1}{8}(1 + \cos 4x)$

4) Quad I

$\boxed{\sin 2\theta = \frac{24}{25} \text{ in QI} \quad \text{find } \sin\theta, \cos\theta, \tan\theta}$

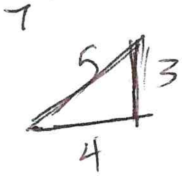
$\sin\frac{x}{2} = \sqrt{\frac{1-\cos 2\theta}{2}}$

$\cos 2\theta = \frac{7}{25} = \sqrt{\frac{1-\frac{7}{25}}{2}}$



$= \sqrt{\frac{\frac{18}{25}}{2}} = \sqrt{\frac{\cancel{18}\,9}{25} \cdot \frac{1}{\cancel{2}}}$

$= \sqrt{\frac{9}{25}} = \frac{3}{5}$



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

$\tan\theta = \frac{3}{4}$