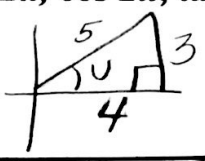
Example #3 **Find the exact values of sin 2*u*, cos 2*u*, tan 2*u*, if sin $u = \frac{3}{5}$, and $0 < u < \frac{\pi}{2}$**



$\sin 2u = 2\sin u \cos u$

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

$\sin 2u = \frac{24}{25}$

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

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

$= \frac{16}{25} - \frac{9}{25}$

$\cos 2u = \frac{7}{25}$

$\tan 2u = \frac{2\tan u}{1-\tan^2 u} = \frac{2(3/4)}{1-(3/4)^2} = \frac{3/2}{1-9/16} = \frac{3/2}{7/16} = \frac{3}{2} \cdot \frac{16}{7} = \frac{24}{7}$

$\tan 2u = \frac{24}{7}$

Example #4 **Verify: $\cos 3x = 4\cos^3 x - 3\cos x$**

$\cos(2x + x) =$

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

$(2\cos^2 x - 1)(\cos x) - (2\sin x \cos x)(\sin x) =$

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

$2\cos^3 x - \cos x - 2(1 - \cos^2 x)\cos x =$

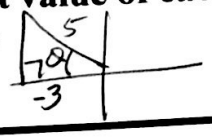
$2\cos^3 x - \cos x - 2\cos x + 2\cos^3 x =$

$4\cos^3 x - 3\cos x = 4\cos^3 x - 3\cos x$

Example #5 **Find the exact value of $\cos^2 15° - \sin^2 15°$.**

$\cos(2 \cdot 15°) = \cos 30° = \frac{\sqrt{3}}{2}$

Example #6 **If $\sin\theta = \frac{4}{5}$ and θ lies in quadrant II, find the exact value of each of the following: $\sin 2\theta$, $\cos 2\theta$, $\tan 2\theta$.**



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

$= 2(4/5)(-3/5) = \boxed{-24/25 = \sin 2\theta}$

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

$= (-3/5)^2 - (4/5)^2$

$= 9/25 - 16/25$

$\cos 2\theta = -7/25$

$\tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta} = \frac{2(-4/3)}{1-(-4/3)^2} = \frac{-8/3}{1-16/9} = \frac{-8/3}{-7/9} = -8/3 \cdot -9/7$

$\frac{24}{7} = \tan 2\theta$

Example #7 **Solve $2\cos x + \sin 2x = 0$.**

$2\cos x + 2\sin x\cos x = 0$

$2\cos x(1+\sin x) = 0$

$2\cos x = 0$ $\quad 1+\sin x = 0$

$\cos x = 0$ $\quad \sin x = -1$

$x = \pi/2, 3\pi/2$ $\quad x = \frac{3\pi}{2}$

$\left\{\frac{\pi}{2} + 2n\pi, \frac{3\pi}{2} + 2n\pi\right\}$