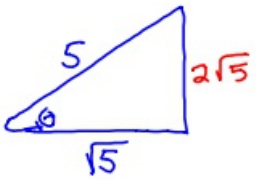
4-19-18 1st Trig

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

① If θ is in 1st quadrant and $\cos\theta = \frac{\sqrt{5}}{5}$, find $\sin(2\theta)$.



$(\sqrt{5})^2 + b^2 = 5^2$

$\sqrt{5}\cdot\sqrt{5} = 5$ $\quad 5 + b^2 = 25$

$\sqrt{b^2} = \sqrt{20}$

$b = 2\sqrt{5}$

$\sqrt{2\cdot 2\cdot 5}$

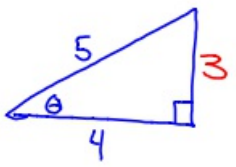
$\sin(2\theta) = 2 \cdot \sin\theta \cdot \cos\theta$

$= \frac{2}{1} \cdot \frac{2\sqrt{5}}{5} \cdot \frac{\sqrt{5}}{5}$

$= \frac{20}{25}$

$= \frac{4}{5}$

② Find $\sin(2\theta)$ if θ is in first quadrant and $\cos\theta = \frac{4}{5}$.



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

$= \frac{2}{1} \cdot \frac{3}{5} \cdot \frac{4}{5}$

$= \frac{24}{25}$

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

(3) Find $\cos(2\theta)$ if θ is in 1st quadrant and $\cos\theta = \frac{3}{5}$.

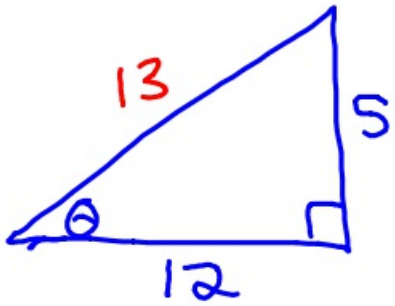
No need to draw $\triangle$ since

$$\cos(2\theta) = 2\cdot\cos^2\theta - 1$$
$$= \frac{2}{1}\cdot\left(\frac{3}{5}\right)^2 - 1$$
$$= \frac{2}{1}\cdot\frac{3}{5}\cdot\frac{3}{5} - 1$$
$$= \frac{18}{25} - 1$$
$$= \frac{18}{25} - \frac{25}{25}$$
$$= \frac{-7}{25}$$

(4) If $\sin\theta = \frac{1}{2}$ and θ is in the 1st quadrant, find $\cos(2\theta)$.

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

⑤ If $\tan\theta = \frac{5}{12}$ and θ is in 1st quadrant, find $\cos(2\theta)$



$5^2 + 12^2 = c^2$

$c = 13$

We can use any of the 3 formulas we want.

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

$$= \left(\frac{12}{13}\right)^2 - \left(\frac{5}{13}\right)^2$$

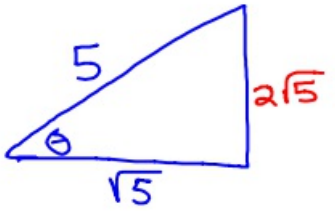
$$= \frac{144}{169} - \frac{25}{169}$$

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

4-19-18 3rd Trig

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

① If $\cos\theta = \frac{\sqrt{5}}{5}$ and θ is in the 1st quadrant, what is $\sin(2\theta)$?



$(\sqrt{5})^2 + b^2 = 5^2$

$5 + b^2 = 25$

$\sqrt{b^2} = \sqrt{20}$

$\sqrt{2 \cdot 2 \cdot 5}$ $\quad b = 2\sqrt{5}$

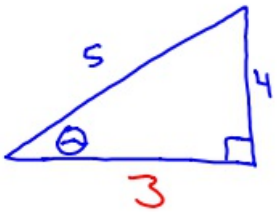
$\sin(2\theta) = 2 \cdot \cos\theta \cdot \sin\theta$

$\frac{2}{1} \cdot \frac{\sqrt{5}}{5} \cdot \frac{2\sqrt{5}}{5}$

$\frac{20}{25}$

$\frac{4}{5}$

② If $\sin\theta = \frac{4}{5}$ and θ is in 1st quadrant, find $\sin(2\theta)$?



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

$\frac{2}{1} \cdot \frac{4}{5} \cdot \frac{3}{5}$

$\frac{24}{25}$

③ If $\cos\theta = \frac{1}{3}$ and θ is in 1st quadrant, what is $\cos(2\theta)$?

We get to pick which formula we use.

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

It only makes sense to use

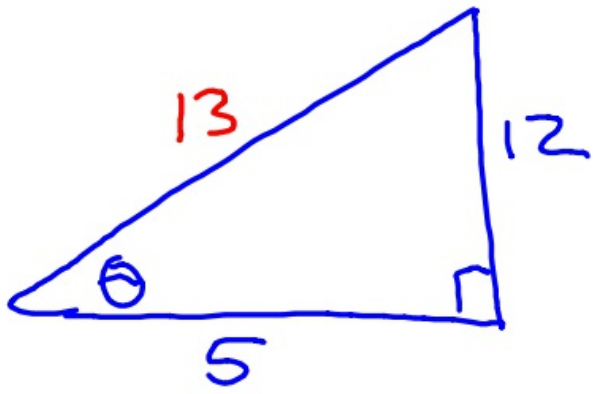
$$\cos(2\theta) = 2\cdot\cos^2\theta - 1$$
$$= \frac{2}{1}\cdot\left(\frac{1}{3}\right)^2 - 1$$
$$= \frac{2}{1}\cdot\frac{1}{3}\cdot\frac{1}{3} - 1$$
$$= \frac{2}{9} - 1$$
$$= \frac{2}{9} - \frac{9}{9}$$
$$= \frac{-7}{9}$$

④ If $\sin\theta = \frac{1}{4}$ and θ is in the 1st quadrant, find $\cos(2\theta)$?

Which formula should we use?

$$\cos(2\theta) = 1 - 2\cdot\sin^2\theta$$
$$1 - 2\cdot\left(\frac{1}{4}\right)^2$$
$$= 1 - \frac{2}{1}\cdot\frac{1}{4}\cdot\frac{1}{4}$$
$$= 1 - \frac{2}{16}$$
$$= \frac{16}{16} - \frac{2}{16}$$
$$= \frac{14}{16}$$
$$= \frac{7}{8}$$

(5) If $\tan\theta = \frac{12}{5}$ and θ is in 1st quadrant, what is $\cos(2\theta)$?



$5^2 + 12^2 = c^2$

$c = 13$

We can use any of the 3 formulas we want.

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

$= \left(\frac{5}{13}\right)^2 - \left(\frac{12}{13}\right)^2$

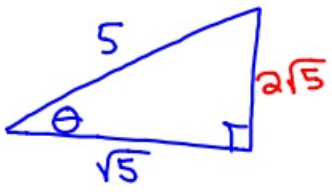
$\frac{25}{169} - \frac{144}{169}$

$\frac{-119}{169}$

4-19-18 4th Trig

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

① If $\cos\theta = \frac{\sqrt{5}}{5}$ and θ is in the 1st quadrant, what is $\sin(2\theta)$?



$(\sqrt{5})^2 + b^2 = 5^2$

$5 + b^2 = 25$

$\sqrt{b^2} = \sqrt{20}$

$\sqrt{2 \cdot 2 \cdot 5}$

$b = 2\sqrt{5}$

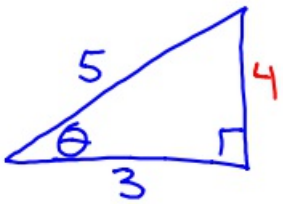
$\sin(2\theta) = 2 \cdot \sin\theta \cdot \cos\theta$

$= \frac{2}{1} \cdot \frac{2\sqrt{5}}{5} \cdot \frac{\sqrt{5}}{5}$

$= \frac{20}{25}$

$= \frac{4}{5}$

② If $\cos\theta = \frac{3}{5}$ and θ is in the 1st quadrant, find $\sin(2\theta)$.



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

$= \frac{2}{1} \cdot \frac{4}{5} \cdot \frac{3}{5}$

$= \frac{24}{25}$

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

(3) If $\cos\theta = \frac{3}{4}$ and θ is in 1st quadrant, what is $\cos(2\theta)$?

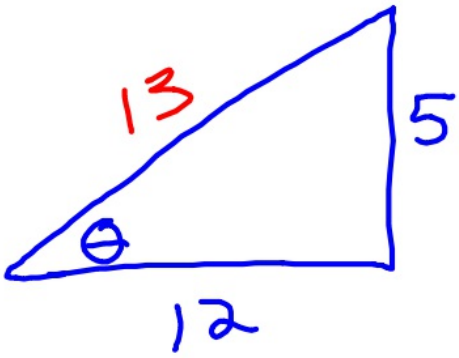
$$\cos(2\theta) = 2\cdot\cos^2\theta - 1$$
$$= \frac{2}{1}\cdot\left(\frac{3}{4}\right)^2 - 1$$
$$= \frac{2}{1}\cdot\frac{3}{4}\cdot\frac{3}{4} - 1$$
$$= \frac{18}{16} - 1$$
$$= \frac{18}{16} - \frac{16}{16}$$
$$= \frac{2}{16}$$
$$= \frac{1}{8}$$

(4) If $\sin\theta = \frac{1}{3}$ and θ is in 1st quadrant, what is $\cos(2\theta)$?

It makes the most sense to use $\cos(2\theta) = 1 - 2\sin^2\theta$

$$= 1 - \frac{2}{1}\cdot\left(\frac{1}{3}\right)^2$$
$$= 1 - \frac{2}{1}\cdot\frac{1}{3}\cdot\frac{1}{3}$$
$$= 1 - \frac{2}{9}$$
$$= \frac{9}{9} - \frac{2}{9}$$
$$= \frac{7}{9}$$

⑤ If $\tan\theta = \frac{5}{12}$ and θ is in the 1st quadrant, find $\cos(2\theta)$.



$5^2 + 12^2 = c^2$

$c = 13$

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

$\left(\frac{12}{13}\right)^2 - \left(\frac{5}{13}\right)^2$

$\frac{144}{169} - \frac{25}{169}$

$\frac{119}{169}$