Double Angle Identities p. 60

***Write these in graphic organizer on p.51

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

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

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

or $2\cos^2 u - 1$

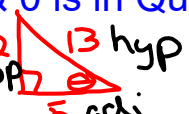
or $1 - 2\sin^2 u$

Write on this page (p.60)

*Use identities on p. 51!

If $\cos \theta = 5/13$ & θ is in Quadrant I, find each:

same as u



$5^2 + b^2 = 13^2$

$25 + b^2 = 169$

$b^2 = 144$

$b = 12$

1. $\sin 2\theta = 2\sin u \cos u$

$\frac{2}{1}\left(\frac{12}{13}\right)\left(\frac{5}{13}\right) = \frac{120}{169}$

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

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

$\frac{25}{169} - \frac{144}{169} = \frac{-119}{169}$

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

$\frac{\frac{2}{1}\left(\frac{12}{5}\right)}{1-\left(\frac{12}{5}\right)^2} = \frac{\frac{24}{5}}{\frac{25}{25} - \frac{144}{25}} = \frac{\frac{24}{5}}{\frac{-119}{25}}$

$\frac{24}{5} \div \frac{-119}{25} = \frac{24}{5} \cdot \frac{-25}{119} = \frac{-120}{119}$

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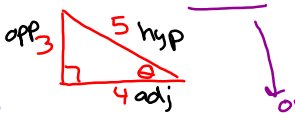
Half Angle Identities p. 61

- $\sin\frac{u}{2} = \pm\sqrt{\frac{1-\cos u}{2}}$
- $\cos\frac{u}{2} = \pm\sqrt{\frac{1+\cos u}{2}}$
- $\tan\frac{u}{2} = \frac{1-\cos u}{\sin u}$ or $\frac{\sin u}{1+\cos u}$

Write on this page (p.61)

* Use identities on p. 161

If $\tan\theta = 3/4$ & θ is in Quadrant I, find the exact value of each:



only need positive ans.

1. sin θ/2

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

$$\sqrt{\frac{1-4/5}{2}} = \sqrt{\frac{\frac{5}{5}-\frac{4}{5}}{2}} = \sqrt{\frac{1/5}{2}} = \sqrt{\frac{1}{5}\div\frac{2}{1}}$$

$$\sqrt{\frac{1}{5}\cdot\frac{1}{2}} = \sqrt{\frac{1}{10}} = \frac{\sqrt{1}}{\sqrt{10}} = \frac{1}{\sqrt{10}}\frac{\sqrt{10}}{\sqrt{10}} = \frac{\sqrt{10}}{10}$$

2. cos θ/2

$$\sqrt{\frac{1+\cos u}{2}} = \sqrt{\frac{1+4/5}{2}} = \sqrt{\frac{5/5+4/5}{2}} = \sqrt{\frac{9/5}{2}}$$

$$\sqrt{\frac{9}{5}\div\frac{2}{1}} = \sqrt{\frac{9}{5}\cdot\frac{1}{2}} = \sqrt{\frac{9}{10}} = \frac{\sqrt{9}}{\sqrt{10}} = \frac{3}{\sqrt{10}}\frac{\sqrt{10}}{\sqrt{10}} = \frac{3\sqrt{10}}{10}$$

3. tan θ/2 $\frac{1-\cos u}{\sin u}$

$$\frac{1-4/5}{3/5} = \frac{5/5-4/5}{3/5} = \frac{1}{5}\div\frac{3}{5} = \frac{1}{5}\cdot\frac{5}{3} = \frac{1}{3}$$

Find the exact value of sin 105° using the half-angle identity

* Look on the unit circle for an angle that 1/2 of it is 105°

$$\sin\left(\frac{210°}{2}\right) \quad \pm\sqrt{\frac{1-\cos u}{2}} \quad \left(\text{cos } -\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$$

↑ use − because sin is − in Q3 (210°)

$$-\sqrt{\frac{1--\frac{\sqrt{3}}{2}}{2}} = -\sqrt{\frac{\frac{2}{2}+\frac{\sqrt{3}}{2}}{2}} = -\sqrt{\frac{\frac{2+\sqrt{3}}{2}}{2}}$$

$$-\sqrt{\frac{2+\sqrt{3}}{2}\div\frac{2}{1}} = -\sqrt{\frac{2+\sqrt{3}}{2}\cdot\frac{1}{2}}$$

$$-\sqrt{\frac{2+\sqrt{3}}{4}} = -\frac{\sqrt{2+\sqrt{3}}}{\sqrt{4}} = -\frac{\sqrt{2+\sqrt{3}}}{2}$$

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