5.3 Sum and Difference Identities

Sin(u+v)=sinucosv+sinvcosu

Sin(u-v)=sinucosv-sinvcosu

Cos(u+v)=cosucosv-sinusinv

Cos(u-v)=cosucosv+sinusinv

Mar 27-12:50 PM

Tangent can be written using the sin and the cos together as a ratio, $\underline{sin}$ or using the tangent sum and difference identity.
cos

tan(u+v)=tanu+tanv
1-tanutanv

tan (u-v)=tanu-tanv
1+tanutanv

Mar 27-12:57 PM

Pg.380   Evaluate Sin 75°

1. 2 angles on the unit circle that add or subtract to 75°

$SIN75 = SIN\underset{uv}{(30+45)} = Sin30cos45+Sin45cos45$

Mar 27-10:18 AM

$Sin\underset{u+v}{(30+45)} = Sin\overset{30}{u}cos\overset{45}{v}+sin\overset{45}{v}cos\overset{30}{u}$

$Sin30cos45+sin45\cdot cos30$

$\dfrac{1}{2}\cdot\dfrac{\sqrt{2}}{2}+\dfrac{\sqrt{2}}{2}\cdot\dfrac{\sqrt{3}}{2}$

$\dfrac{\sqrt{2}}{4}+\dfrac{\sqrt{6}}{4}$

$\boxed{\dfrac{\sqrt{2}+\sqrt{6}}{4}}$

Mar 27-1:11 PM

Evaluate cos$\dfrac{\pi}{12}$ $\dfrac{1}{12}(180)$ Cos 15°

$Cos\underset{uv}{(45-30)} = cosucosv+sinusinv$

$cos45cos30 + sin45 sin30$

$\dfrac{\sqrt{2}}{2}\cdot\dfrac{\sqrt{3}}{2}+\dfrac{\sqrt{2}}{2}\cdot\dfrac{1}{2}$

$\dfrac{\sqrt{6}}{4}+\dfrac{\sqrt{2}}{4}$

$\boxed{\dfrac{\sqrt{6}+\sqrt{2}}{4}}$

$\boxed{\dfrac{\sqrt{6}+\sqrt{2}}{4}}$

Mar 27-10:21 AM

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7. Tan $\dfrac{5\pi}{12}$ $\dfrac{5\pi}{12}\cdot\dfrac{180}{\pi}$ 75

Tan 75

tan (45+30) $\dfrac{Sin(u+v)}{Cos(u+v)}$

Mar 27-10:25 AM

1

$$\frac{\sin 45+30}{\cos 45+30} = \frac{\sin 45\cos 30 + \sin 30\cos 45}{\cos 45\cos 30 - \sin 45\sin 30}$$

$$\frac{u \quad v}{}$$

$$\frac{\frac{\sqrt{2}}{2}\cdot\frac{\sqrt{3}}{2} + \frac{1}{2}\cdot\frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}\cdot\frac{\sqrt{3}}{2} - \frac{\sqrt{2}}{2}\cdot\frac{1}{2}} \qquad \frac{\frac{\sqrt{6}+\sqrt{2}}{4}}{\frac{\sqrt{6}-\sqrt{2}}{4}}$$

Mar 27-1:19 PM

$$\frac{\frac{\sqrt{6}+\sqrt{2}}{4}}{\frac{\sqrt{6}-\sqrt{2}}{4}} \qquad \boxed{\frac{\sqrt{6}+\sqrt{2}}{\sqrt{6}-\sqrt{2}}}$$

Mar 27-1:22 PM

$$\tan(30+45) = \frac{\tan 30 + \tan 45}{1 - \tan 30\cdot\tan 45}$$

$$\frac{u \quad v}{}$$

$$\frac{\frac{\sqrt{3}}{3} + \frac{1\cdot 3}{1\cdot 3}}{1 - \frac{\sqrt{3}}{3}\cdot 1} \qquad \frac{\frac{\sqrt{3}+3}{3}}{3\cdot\frac{1-\frac{\sqrt{3}}{3}}{3}} \qquad \boxed{\frac{\sqrt{3}+3}{3-\sqrt{3}}}$$

Mar 27-1:23 PM

$$\frac{\frac{\sqrt{3}}{3} + \frac{1\cdot 3}{1\cdot 3}}{3\cdot\frac{1-\sqrt{3}}{3\cdot 1}} \qquad \frac{\frac{\sqrt{3}+3}{3}}{\frac{3-\sqrt{3}}{3}} \qquad \boxed{\frac{\sqrt{3}+3}{3-\sqrt{3}}}$$

Mar 27-1:26 PM

Going backwards by condensing-you need to match the theorem to the correct sum or difference identity to decide if you add or subtract u and v.

$$\cos u\cos v \oplus \sin u\sin v$$

$$\cos(u-v)$$

Mar 27-10:28 AM

13. $\sin\frac{\pi}{5}\cos\frac{\pi}{2} \oplus \sin\frac{\pi}{2}\cos\frac{\pi}{5}$

$$u=\frac{\pi}{5} \quad v=\frac{\pi}{2}$$

$$\sin\left(\frac{\pi}{5}+\frac{\pi}{2}\right)$$

$$\boxed{\sin\left(\frac{7\pi}{10}\right)}$$

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

$$\frac{2}{10} + \frac{5}{10}$$

$$\frac{7}{10}$$

Mar 27-10:33 AM

2