e 1. $\tan(a+b) =$

d 2. $\csc^2 x =$

i 3. $\sin(a+b) =$

h 4. $\sec^2 x =$

j 5. $\sin(a-b) =$

b 6. $\cos(a+b) =$

c 7. $\cos 2x =$

a 8. $\cos^2 x =$

f 9. $\tan(a-b) =$

g 10. $\cos(a-b) =$

$$\frac{\sin^2 x+\cos^2 x=1}{\sin^2 x}$$

$$1+\cot^2 x=\csc^2 x$$

$a.\ 1-\sin^2 x$

~~b.~~ $\cos a\cos b-\sin a\sin b$

~~c.~~ $1-2\sin^2 x$

$d.\ 1+\cot^2 x$

~~e.~~ $\dfrac{\tan a+\tan b}{1-\tan a\tan b}$

~~f.~~ $\dfrac{\tan a-\tan b}{1+\tan a\tan b}$

~~g.~~ $\cos a\cos b+\sin a\sin b$

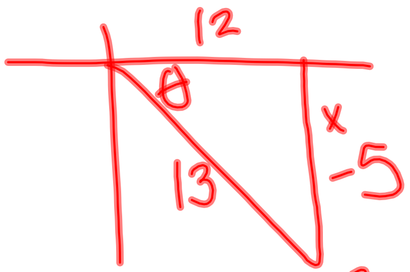
$h.\ 1+\tan^2 x$

~~i.~~ $\sin a\cos b+\cos a\sin b$

~~j.~~ $\sin a\cos b-\cos a\sin b$

11. Find $\cos 2\theta$ given that $\cos\theta=\frac{12}{13}$ and θ is in Quadrant IV.

$$\cos 2\theta=\cos^2\theta-\sin^2\theta$$
$$=\left(\frac{12}{13}\right)^2-\left(\frac{-5}{13}\right)^2$$
$$=\frac{144}{169}-\frac{25}{169}$$
$$=\boxed{\frac{119}{169}}$$



$$12^2+x^2=13^2$$
$$144+x^2=169$$
$$x^2=25$$
$$x=5$$

12. Use the half-angle identity to <u>evaluate</u> $\tan\frac{11\pi}{12}$ exactly.

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

$$\frac{11\pi}{12} = \frac{x}{2} \qquad 2\left(\frac{11\pi}{12}\right) = x \qquad \frac{11\pi}{6} = x$$

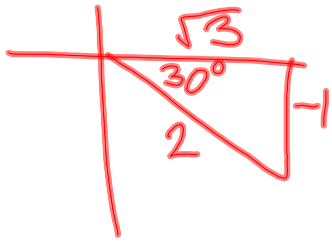
$$\tan\frac{11\pi/6}{2} = \frac{1-\cos\frac{11\pi}{6}}{\sin\frac{11\pi}{6}}$$

$$= \frac{1-\frac{\sqrt{3}}{2}}{\frac{-1}{2}} = \left(1-\frac{\sqrt{3}}{2}\right)\cdot(-2)$$

$$= \boxed{-2+\sqrt{3}}$$

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

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



13. Find all solutions (in radians) in the interval $0 \le x < 2\pi$. $\tan(2x) + 1 = 0$

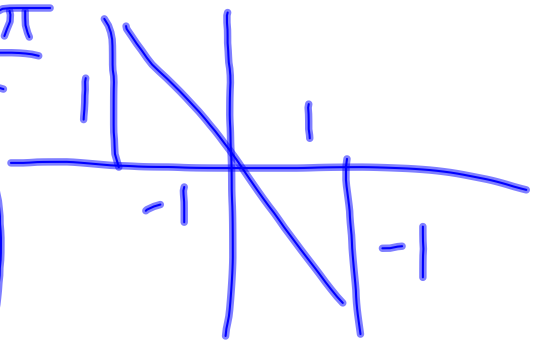
$$\tan(2x) = -1$$

go around unit ○ x2 looking for solutions!

$$0 \le 2x < 4\pi$$

$$2x = \frac{3\pi}{4}, \frac{7\pi}{4}, \frac{11\pi}{4}, \frac{15\pi}{4}$$

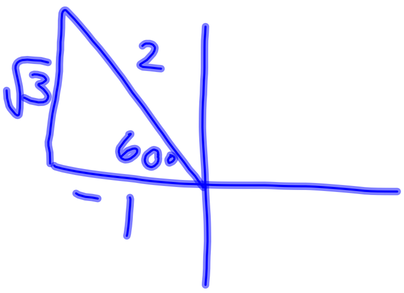
$$\boxed{x = \frac{3\pi}{8}, \frac{7\pi}{8}, \frac{11\pi}{8}, \frac{15\pi}{8}}$$



14. Find the exact value of $\dfrac{\tan 218° - \tan 98°}{1 + \tan 218° \tan 98°}$.

$\tan(a-b) = \dfrac{\tan a - \tan b}{1 + \tan a \tan b}$ $a = 218°$ $b = 98°$

$\tan(218° - 98°) = \tan 120° = \boxed{-\sqrt{3}}$

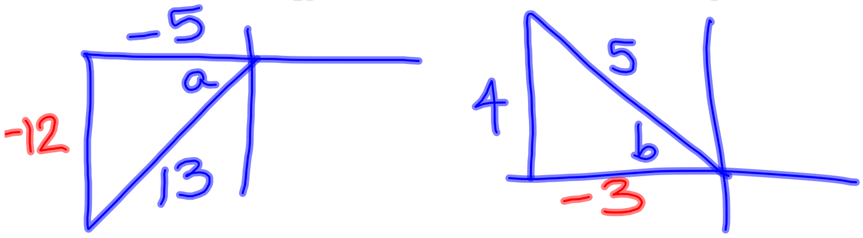


15. <u>Prove</u> the identity. Show ALL steps

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

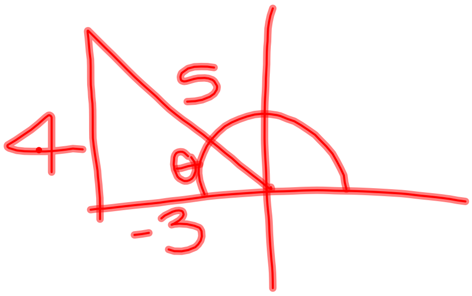
$$\begin{aligned}
LHS &= \cot x \left(1 - 2\sin^2 x\right) \\
&= \cot x - 2\sin^2 x \cot x \\
&= \cot x - 2\sin^{\cancel{2}} x \cdot \frac{\cos x}{\cancel{\sin x}} \\
&= \cot x - \sin 2x \\
&= RHS
\end{aligned}$$

16. Given $\cos a = -\frac{5}{13}$, a is in Quadrant III, $\sin b = \frac{4}{5}$, and b is in Quadrant II, find $\sin(a-b)$.



$$\sin(a-b) = \sin a \cos b - \cos a \sin b$$
$$= \left(\frac{-12}{13}\right)\left(\frac{-3}{5}\right) - \left(\frac{-5}{13}\right)\left(\frac{4}{5}\right)$$
$$= \frac{36}{65} + \frac{20}{65} = \boxed{\frac{56}{65}}$$

17. Evaluate $\sin\left(\underbrace{\sec^{-1}\left(-\frac{5}{3}\right)}_{\theta}\right)$.



$$= \boxed{\frac{4}{5}}$$

18. Find all solutions (in radians) in the interval $0 \le x < 2\pi$. $\cos x = 2\sin^2 x \cos x$

$0 = 2\sin^2 x \cos x - \cos x$

$0 = \cos x\,(2\sin^2 x - 1)$

$\cos x = 0 \qquad 2\sin^2 x - 1 = 0$

$\sin^2 x = 1/2$

$\sin x = \pm \frac{1}{\sqrt{2}}$

$x = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

19. <u>Prove</u> the identity. Show ALL steps

$$\frac{1 + 2\cos^2 x}{\sin^2 x} = 3\csc^2 x - 2$$

$\dfrac{\sin^2 x + \cos^2 x = 1}{\sin^2 x}$

$1 + \cot^2 x = \csc^2 x$

$\cot^2 x = \csc^2 x - 1$

$LHS = \frac{1}{\sin^2 x} + \frac{2\cos^2 x}{\sin^2 x} = \csc^2 x + 2\cot^2 x =$

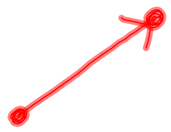
$= \csc^2 x + 2(\csc^2 x - 1) = \csc^2 x + 2\csc^2 x - 2 =$

$= 3\csc^2 x - 2 = RHS$ ✓

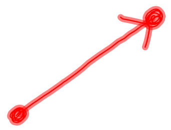
$LHS = \frac{1 + 2(1 - \sin^2 x)}{\sin^2 x} = \frac{1 + 2 - 2\sin^2 x}{\sin^2 x} =$

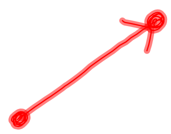
$= \frac{3 - 2\sin^2 x}{\sin^2 x} = \frac{3}{\sin^2 x} - \frac{2\cancel{\sin^2 x}}{\cancel{\sin^2 x}} = 3\csc^2 x - 2 = RHS$

7.5, 7.6 - Vectors

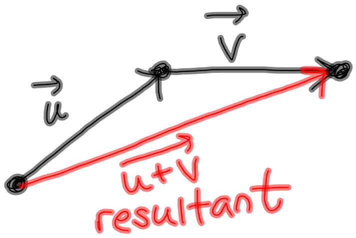


A vector is a directed line segment;
it has a unique length (magnitude) and direction angle



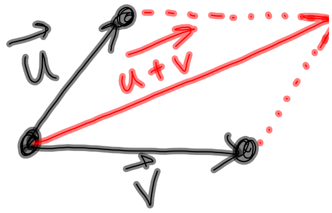


Vector Addition:
Vectors can be added using the
Triangle Method or the Parallelogram Method

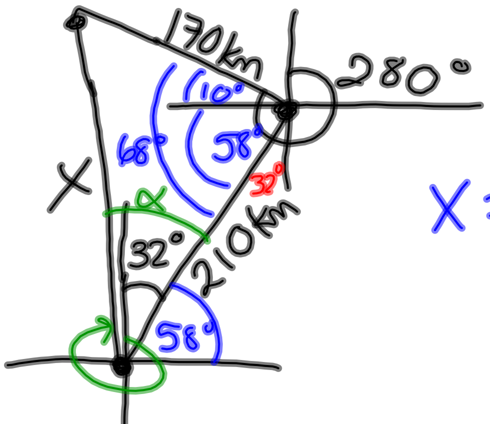


positioning tail/initial pt of $\vec{v}$ at the head/terminal pt. of $\vec{u}$

position both vectors so they have the same initial point



7.5 #28. An airplane flies 032° for 210 km, and then 280° for 170 km. How far is the plane then, from the starting point, and in what direction?



$$x = \sqrt{170^2 + 210^2 - 2(170)(210)\cdot \cos 68^\circ}$$

$$\frac{\sin\alpha}{170} = \frac{\sin 68^\circ}{x}$$

$$\alpha = \sin^{-1}\left(\frac{170\sin 68^\circ}{x}\right)$$

Homework:

- **"Chapter 5 Test" on pages 526-527 of your textbook**
- **"Chapter 6 Test" on page 591 of your textbook**

(to be collected on Wednesday)

- **Read sections 7.5 and 7.6 before class tomorrow (Tuesday)**