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

h 2. $\csc^2 x =$

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

g 4. $\sec^2 x =$

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

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

f 7. $\cos 2x =$

e 8. $\cos^2 x =$

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

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

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

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

$c.\ \cos a \cos b + \sin a \sin b$

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

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

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

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

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

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

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

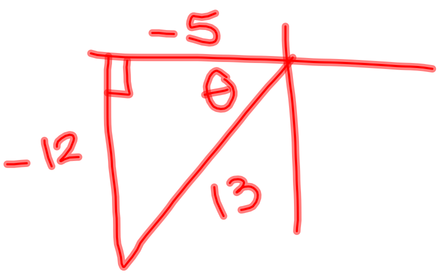
11. Find $\cos 2\theta$ given that $\sin\theta = -\frac{12}{13}$ and θ is in Quadrant III.

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

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

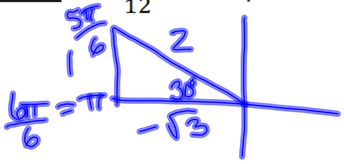
$$= \frac{25}{169} - \frac{144}{169}$$

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



12. Use the half-angle identity to <u>evaluate</u> $\tan\frac{5\pi}{12}$ exactly.

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



$$\tan\frac{5\pi}{12} = \tan\frac{\boxed{5\pi/6}}{2} = \frac{1-\cos\frac{5\pi}{6}}{\sin\frac{5\pi}{6}}$$

$$\frac{5\pi}{12} = \frac{\theta}{2}$$

$$10\pi = 12\theta$$

$$\frac{10\pi}{12} = \theta$$

$$\frac{5\pi}{6} = \theta$$

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

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

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

13. Find all solutions (in radians) in the interval $0 \le x < 2\pi$. $\cos(3x) + 1 = 0$

$$0 \le 3x < 6\pi$$

$$\cos\boxed{3x} = -1$$

$$3x = \pi, 3\pi, 5\pi$$

$$\boxed{x = \frac{\pi}{3}, \pi, \frac{5\pi}{3}}$$

14. Find the exact value of $\sin 218° \cos 98° - \cos 218° \sin 98°$.

$$= \sin(218° - 98°)$$

$$= \sin 120°$$

$$= \boxed{\frac{\sqrt{3}}{2}}$$

15. Prove the identity. Show ALL steps in order to receive full credit.

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

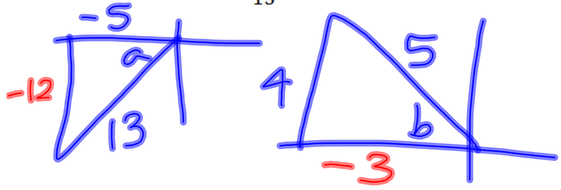
$$LHS = \frac{\cancel{2}(\cos^2 x - \sin^2 x)}{\cancel{2}\sin x \cos x} = \frac{\cos^2 x}{\sin x \cos x} - \frac{\sin^2 x}{\sin x \cos x}$$

$$= \frac{\cos x \cancel{\cos x}}{\sin x \cancel{\cos x}} - \frac{\cancel{\sin x}\sin x}{\cancel{\sin x}\cos x}$$

$$= \cot x - \tan x$$

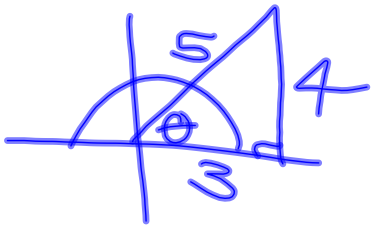
$$= RHS.$$

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



$$\cos(a-b) = \cos a \cos b + \sin a \sin b$$
$$= \left(\frac{-5}{13}\right)\left(\frac{-3}{5}\right) + \left(\frac{-12}{13}\right)\left(\frac{4}{5}\right)$$
$$= \frac{15}{65} - \frac{48}{65} = \boxed{\frac{-33}{65}}$$

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



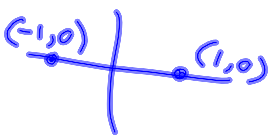
$$= \boxed{\frac{4}{5}}$$

18. Find all solutions (in radians) in the interval $0 \le x < 2\pi$. $4\sin x\cos^2 x = 3\sin x$

$$4\sin x\cos^2 x - 3\sin x = 0$$
$$4ab^2 - 3a = 0$$
$$a(4b^2 - 3) = 0$$
$$\sin x(4\cos^2 x - 3) = 0$$

$\sin x = 0$

$\boxed{x = 0, \pi}$



$4\cos^2 x - 3 = 0$

$\cos^2 x = \frac{3}{4}$

$\cos x = \pm\frac{\sqrt{3}}{2}$

$$\boxed{x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}}$$

19. Prove the identity. Show ALL steps in order to receive full credit.

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

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

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

$$= 3\csc^2 x - 2 = RHS_\square$$

A. Determine the quadrant in which the angle 2θ from problem #11 lies, and explain how you determined that quadrant.

$\cos 2\theta < 0$ (from #11)

$\sin 2\theta = 2\sin\theta\cos\theta > 0$ $(-,+)$

plug in actual values

$2\theta \in QII$

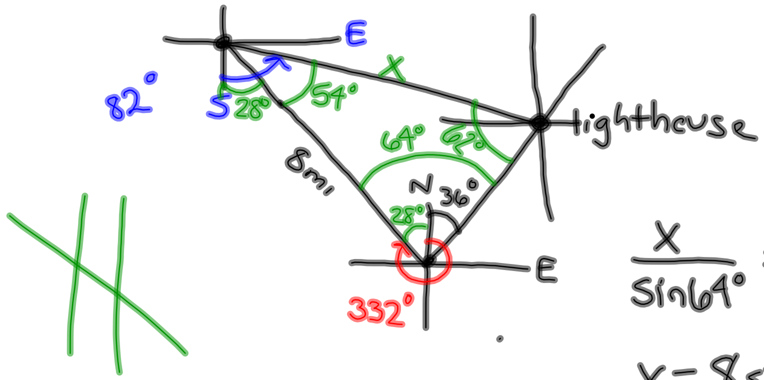
B. Find all solutions (in radians) in the interval $0 \le x < 2\pi$.

$$\cos 3x + \cos x = 0$$

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

7.2 handout

35. ship to lighthouse N36°E
8 mi @ heading of 332°
clockwise from north
ship to lighthouse S82°E



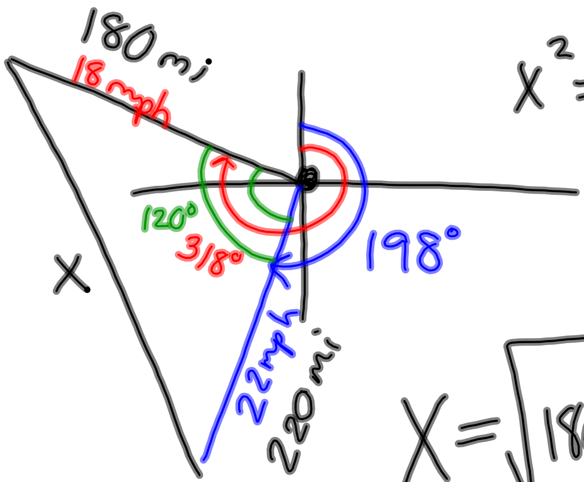
$$\frac{x}{\sin 64^\circ} = \frac{8}{\sin 62^\circ}$$

$$x = \frac{8\sin 64^\circ}{\sin 62^\circ}$$

$$\approx \boxed{8.1 \text{ mi}}$$

7.2

43.



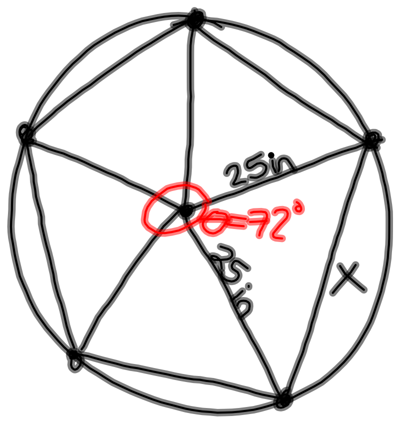
SAS ⇒
law of cosines

$$x^2 = (180)^2 + (220)^2 - 2(180)(220)\cos 120^\circ$$

$$x = \sqrt{180^2 + 120^2 - 2(180)(220)\cos 120^\circ}$$

$$\approx 350 \text{ mi}$$

46.



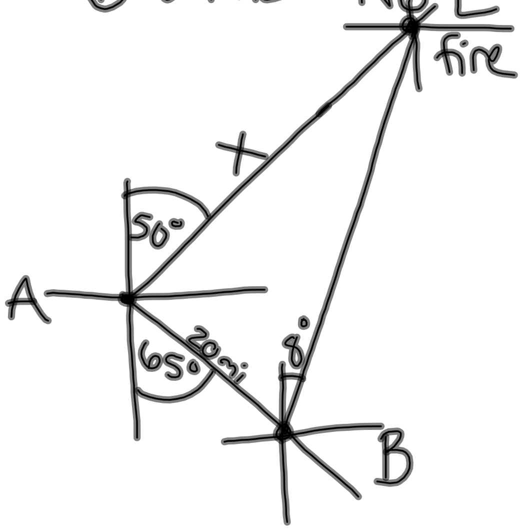
$x^2 = 25^2 + 25^2 - 2(25)(25)\cos 72°$

$x = \sqrt{25^2 + 25^2 - 2(25)(25)\cos 72°}$

$\approx \boxed{29\text{ in}}$

7.1

34. A to B 20 mi
S65°E
A to fire N50°E $x = ?$
B to fire N8°E



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

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

Homework:

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

- Read sections 7.5 and 7.6 before class Monday