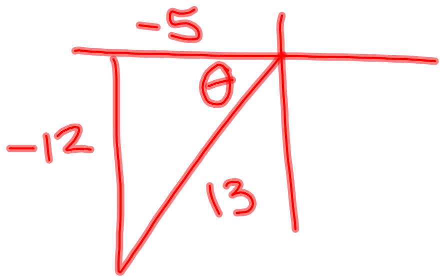
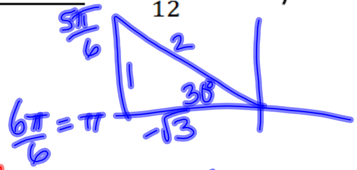
i 1. $\tan(a+b) =$	$a.$ $\sin a \cos b + \cos a \sin b$
h 2. $\csc^2 x =$	$b.$ $\sin a \cos b - \cos a \sin b$
a 3. $\sin(a+b) =$	$c.$ $\cos a \cos b + \sin a \sin b$
g 4. $\sec^2 x =$	$d.$ $\cos a \cos b - \sin a \sin b$
b 5. $\sin(a-b) =$	$e.$ $1 - \sin^2 x$
d 6. $\cos(a+b) =$	$f.$ $1 - 2\sin^2 x$
f 7. $\cos 2x =$	$g.$ $1 + \tan^2 x$
e 8. $\cos^2 x =$	$h.$ $1 + \cot^2 x$
j 9. $\tan(a-b) =$	$i.$ $\dfrac{\tan a + \tan b}{1 - \tan a \tan b}$
c 10. $\cos(a-b) =$	$j.$ $\dfrac{\tan a - \tan b}{1 + \tan a \tan b}$

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.



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

$$\tan\frac{5\pi}{12} = \tan\frac{\boxed{\theta}}{2} = \tan\frac{5\pi/6}{2}$$

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

$$10\pi = 12\theta$$

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

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

$$= \frac{1-\cos\frac{5\pi}{6}}{\sin\frac{5\pi}{6}} = \frac{1-\left(-\frac{\sqrt{3}}{2}\right)}{\frac{1}{2}}$$

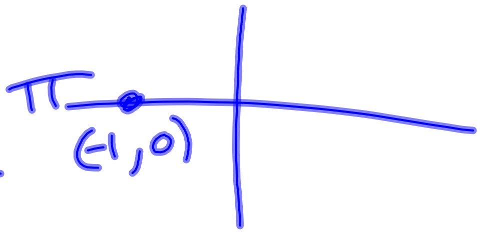
$$= \left(1+\frac{\sqrt{3}}{2}\right)\left(\frac{2}{1}\right)$$

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

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

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

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



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

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

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

$= \sin(218^\circ - 98^\circ)$

$= \sin 120^\circ$

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

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

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

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

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

$= \cot x - \tan x$

$= RHS$ ▫

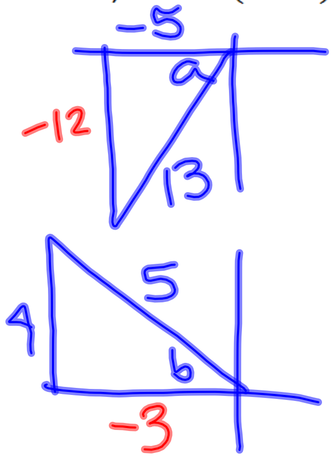
16. Given $\cos a = -\frac{5}{13}$, a is in Quadrant III, $\sin b = \frac{4}{5}$, and b is in Quadrant II, find $\cos(a-b)$.

$\cos(a-b) = \cos a \cos b + \sin a \sin b$

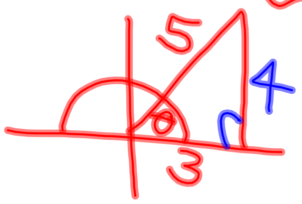
$= \left(\frac{-5}{13}\right)\left(\frac{-3}{5}\right) + \left(\frac{-12}{13}\right)\left(\frac{4}{5}\right)$

$= \frac{15}{65} - \frac{48}{65}$

$= \boxed{\frac{-33}{65}}$



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 $0 \le x < 2\pi$. $4 \sin x \cos^2 x = 3 \sin x$

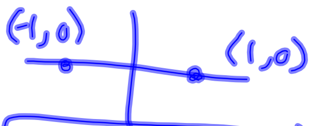
$4\sin x \cos^2 x - 3\sin x = 0$

$4ab^2 - 3a = 0$

$a(4b^2 - 3) = 0$

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

$\sin x = 0$



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

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

$\cos^2 x = 3/4$

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

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

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

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

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

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

$$= 3\csc^2 x - 2 = RHS$$

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

In #11, we found that $\cos 2\theta < 0$

$\sin 2\theta = 2\sin\theta\cos\theta = \uparrow = \square > 0$

plug in actual values

$\Rightarrow 2\theta \in Q\ \mathrm{II}$

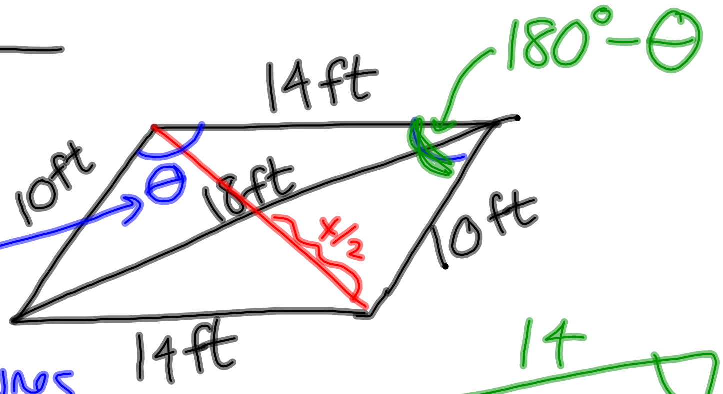
B. Find all solutions (in radians) in the interval $0 \le x < 2\pi$.

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

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

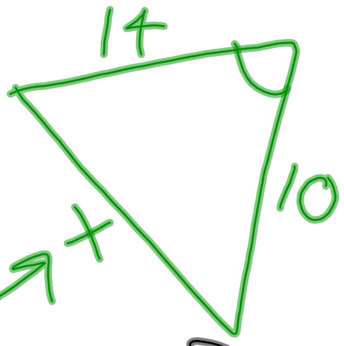
7.2

48.



found using Law of Cosines

SSS

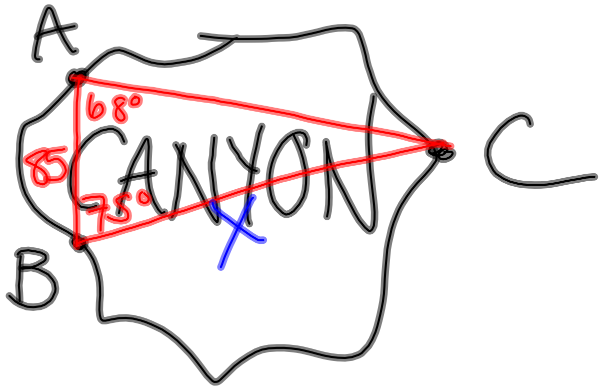


find using law of cosines

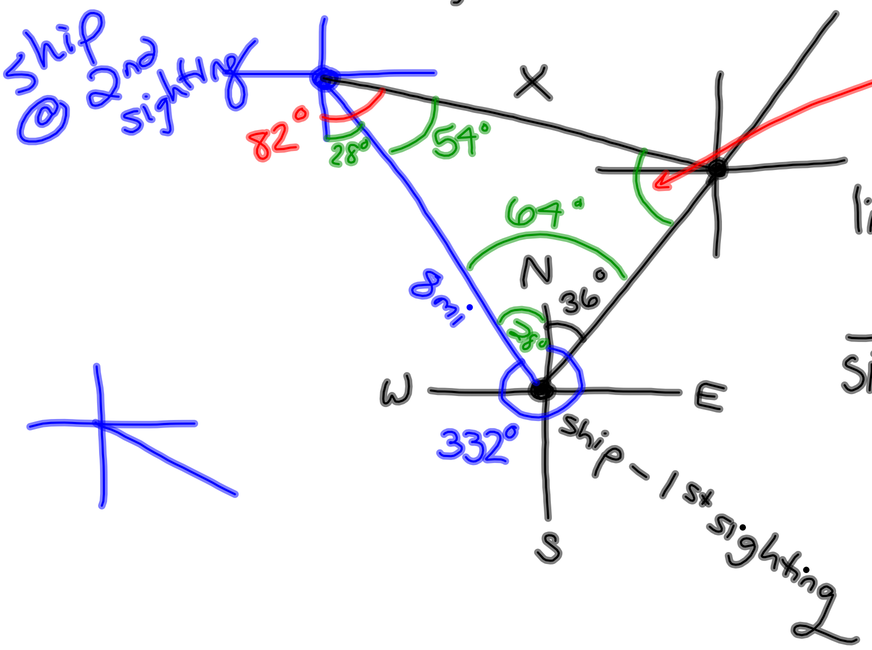
SAS

7.1

29.



7.1
35. ship to lighthouse N36°E
8 mi @ heading of 332° measured clockwise from N
Ship to lighthouse S82°E x = ?

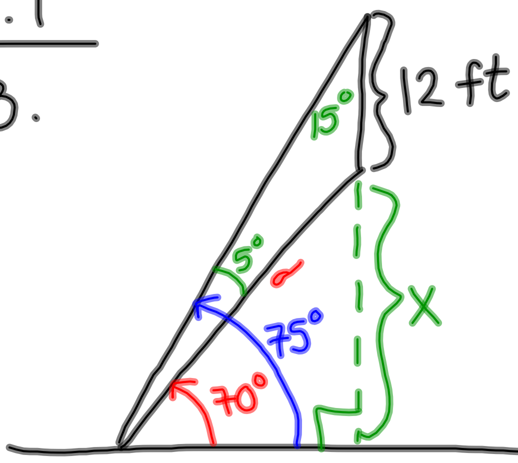


$$\frac{x}{\sin 64°} = \frac{8}{\sin 58°}$$

$$x = \frac{8\sin 64°}{\sin 58°}$$

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

7.1
33.



$$\frac{a}{\sin 15°} = \frac{12}{\sin 5°}$$

$$a = \frac{12\sin 15°}{\sin 5°}$$

$$\sin 70° = \frac{x}{a}$$

$$x = a\sin 70°$$

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**