

Due Tues. 2/7:

- 7.1 #7-21 odd
- 7.2 #9-19 odd
- 7.2 #25-29 odd

Evaluate the following trigonometric expressions:

11. $\sec \frac{\pi}{4}$ $\sqrt{2}$

12. $\cos(-420^\circ)$ $= \frac{1}{2}$

solving triangles with Law of Sines
 solving triangles with Law of Cosines
 area

Test #4 - Wed. Feb 8

13. $\tan(-90^\circ)$ undefined

14. $\sin 135^\circ$ $\frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$

Evaluate the inverse trig function. Give your answer in radians.

15. $\sin^{-1} \left(-\frac{1}{2} \right)$ $-\frac{\pi}{6}$

16. $\cos^{-1} \frac{1}{\sqrt{2}}$ $\frac{\pi}{4}$

I. Solve, finding all solutions in $[0, 2\pi)$:

1. $2\sin^2 x = \sin x$

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

$\sin x (2\sin x - 1) = 0$

$\sin x = 0, \quad \sin x = \frac{1}{2}$

$x = 0, \pi; \frac{\pi}{6}, \frac{5\pi}{6}$

$$2. \quad 1 - 4\cos^2 x = 0$$

$$1 = 4\cos^2 x$$

$$\frac{1}{4} = \cos^2 x$$

$$\pm \frac{1}{2} = \cos x$$

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

$$3. \quad \sin 2x \cos x + \cos 2x \sin x = 0 \quad x \in [0, 2\pi)$$

$$\sin(2x+x) = 0$$

$$\sin 3x = 0$$

$$3x = 0, \pi; 2\pi, 3\pi; 4\pi, 5\pi$$

$$x = 0, \frac{\pi}{3}, \frac{2\pi}{3}, \pi, \frac{4\pi}{3}, \frac{5\pi}{3}$$

II. Solve for x. (all solutions, no restrictions)

4. $\sin 2x - \sin x = 0$

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

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

$$\sin x = 0$$

$$\left\{ \begin{array}{l} x = 0 + 2\pi k \\ x = \pi + 2\pi k \end{array} \right.$$

$$x = \pi k$$

$$\cos x = \frac{1}{2}$$

$$\left\{ \begin{array}{l} x = \frac{\pi}{3} + 2\pi k \\ x = \frac{5\pi}{3} + 2\pi k \end{array} \right.$$

5. $\cos 3x + 1 = 0$

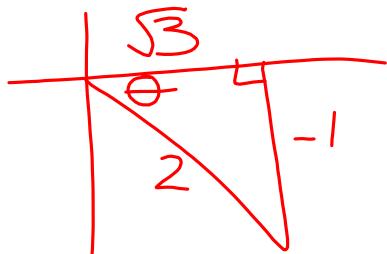
$$\cos 3x = -1$$

$$3x = \pi + 2\pi k$$

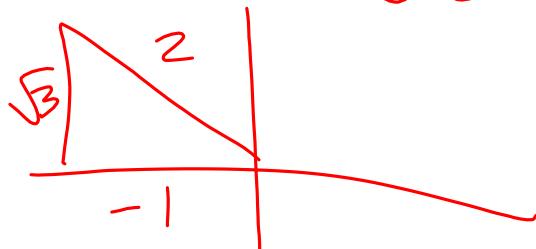
$$x = \frac{\pi}{3} + \frac{2\pi k}{3}$$

$$19. \tan(\sin^{-1}(-\frac{1}{2})) = \boxed{-\frac{1}{\sqrt{3}}}$$

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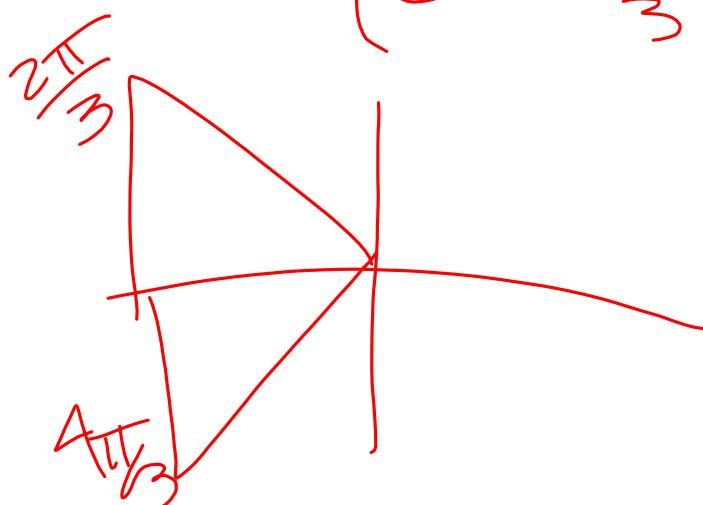


$$14. \cos^{-1}(-\frac{1}{2}) = \frac{2\pi}{3}$$



$$15. \tan^{-1}\sqrt{3} = \frac{\pi}{3}$$

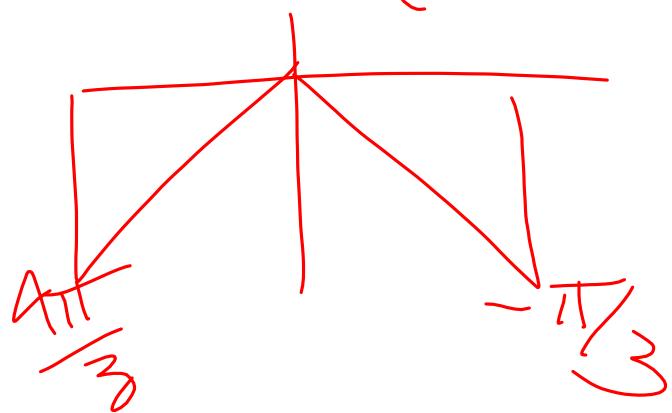
$$16. \cos^{-1}\left(\cos \frac{4\pi}{3}\right) = \frac{2\pi}{3}$$



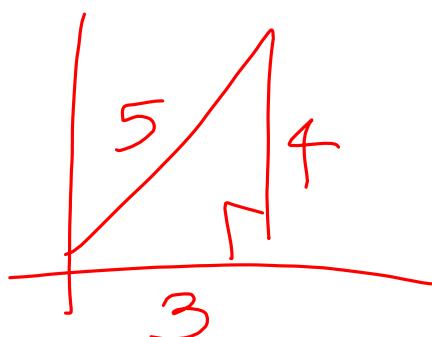
$$17. \sin(\underbrace{\sin^{-1} 2})$$

Undefined

$$18. \sin^{-1}(\sin \frac{4\pi}{3}) = \boxed{-\frac{\pi}{3}}$$



20.



$$\cot(\cos^{-1}\left(\frac{3}{5}\right))$$

$$= \boxed{\frac{3}{4}}$$

$$21. = \cos 270 = \boxed{0}$$

$$22. \frac{\cos x}{\csc x - \sin x} = \tan x$$

$$\text{LHS} = \frac{\cos x}{\frac{1}{\sin x} - \sin x} \cdot \frac{\sin x}{\sin x} = \frac{\cos x}{\frac{1 - \sin^2 x}{\sin x}} =$$

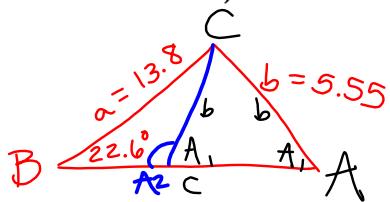
$$= \frac{\cos x}{1} \cdot \frac{\sin x}{1 - \sin^2 x} = \frac{\cos x}{1} \cdot \frac{\sin x}{\cos^2 x} = \tan x$$

$$23. (\cos x - \sin x)^2 = 1 - \sin 2x \quad | \quad (a-b)^2 = a^2 - 2ab + b^2$$

$$\text{LHS} = \cos^2 x - 2\sin x \cos x + \sin^2 x \\ = 1 - \sin 2x$$

Solve the triangle.

$$18. B = 22.6^\circ, b = 5.55, a = 13.8$$



$$\frac{\sin A}{13.8} = \frac{\sin 22.6^\circ}{5.55}$$

$$A = \sin^{-1} \left(\frac{13.8 \sin 22.6^\circ}{5.55} \right) = 72.9^\circ = A_1$$

ASS

since $b < a$, could have
0, 1, or 2 sol'ns

$$C = 180^\circ - 22.6^\circ - 72.9^\circ$$

$$C_1 = 84.5^\circ \quad \frac{c}{\sin 84.5^\circ} = \frac{5.55}{\sin 22.6^\circ}$$

$$c = \frac{5.55 \sin 84.5^\circ}{\sin 22.6^\circ}$$

$$c_1 = 14.4$$

Case 2:

$$A_2 = 180^\circ - 72.9^\circ = 107.1^\circ = A_2$$

$$C_2 = 180^\circ - 22.6^\circ - 107.1^\circ = 50.3^\circ = C_2$$

$$\frac{c}{\sin 50.3^\circ} = \frac{5.55}{\sin 22.6^\circ}$$

$$c = \frac{5.55 \sin 50.3^\circ}{\sin 22.6^\circ} = 11.1 = c_2$$

5. $a = 12$, $b = 14$, $c = 20$; Find angle B.

$$\begin{aligned} b^2 &= a^2 + c^2 - \cancel{2ac \cos B} \\ \cancel{2ac \cos B} &= a^2 + c^2 - b^2 \\ B &= \cos^{-1} \left(\frac{a^2 + c^2 - b^2}{2ac} \right) = \cos^{-1} \left(\frac{12^2 + 20^2 - 14^2}{2 \times 12 \times 20} \right) \\ &= (43.5^\circ) \end{aligned}$$

Find the area of the given triangle.

7. $B = 42^\circ$, $a = 7.2 \text{ ft}$, $c = 3.4 \text{ ft}$

$$\begin{aligned} \frac{1}{2} \text{ product of 2 sides \& Sine of included angle} \\ \text{Diagram: } \begin{array}{c} \text{A triangle with vertices at the top left and bottom right.} \\ \text{The top-left vertex is labeled 'B'.} \\ \text{The side opposite vertex 'B' is labeled 'a = 7.2'.} \\ \text{The side adjacent to vertex 'B' is labeled 'c = 3.4'.} \\ \text{The included angle between sides 'a' and 'c' is labeled '42^\circ'.} \end{array} \\ \text{Area: } \begin{aligned} \text{area} &= \frac{1}{2} (7.2)(3.4) \sin 42^\circ \\ &= [8.2 \text{ ft}^2] \end{aligned} \end{aligned}$$