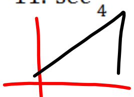
<u>Due Tues. 2/7:</u>

Test #4 - Wed. Feb 8

- 7.1 #7-21 odd — solving triangles with Law of Sines
- 7.2 #9-19 odd — solving triangles with Law of Cosines
- 7.2 #25-29odd — area

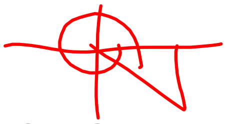
Evaluate the following trigonometric expressions:

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

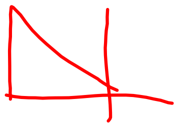


13. $\tan(-90°)$ $\boxed{\text{undefined}}$

12. $\cos(-420°)$ $= \boxed{\frac{1}{2}}$

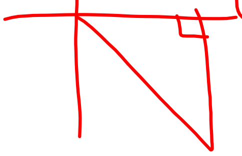


14. $\sin 135°$ $\boxed{\frac{1}{\sqrt{2}}} = \frac{\sqrt{2}}{2}$

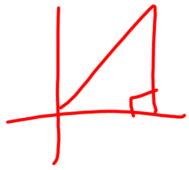


Evaluate the inverse trig function. Give your answer in radians.

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



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



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

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

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

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

$\sin x = 0$, $\sin x = 1/2$

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

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

$1 = 4\cos^2 x$

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

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

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

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

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

$\sin 3x = 0$

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

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

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

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

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

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

$\sin x = 0$ $\cos x = \frac{1}{2}$

$x = 0 + 2\pi k$

$x = \pi + 2\pi k$

$\boxed{x = \pi k}$

$\boxed{x = \pi/3 + 2\pi k \quad x = 5\pi/3 + 2\pi k}$

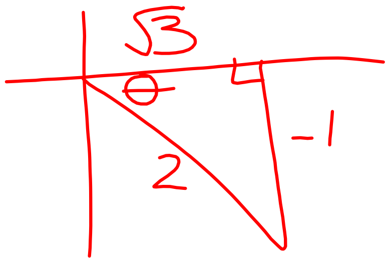
5. $\cos 3x + 1 = 0$

$\cos 3x = -1$

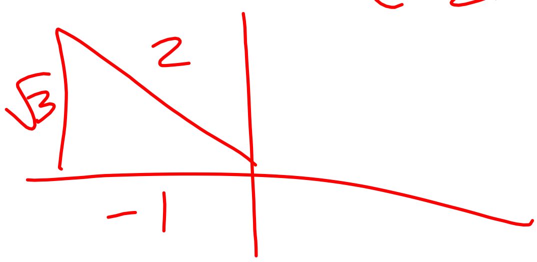
$3x = \pi + 2\pi k$

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

19. $\tan\left(\underbrace{\sin^{-1}\left(-\frac{1}{2}\right)}_{\theta}\right) = \boxed{-\frac{1}{\sqrt{3}}}$

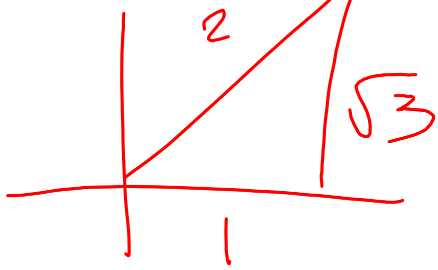


14. $\cos^{-1}\left(-\frac{1}{2}\right) = \frac{2\pi}{3}$

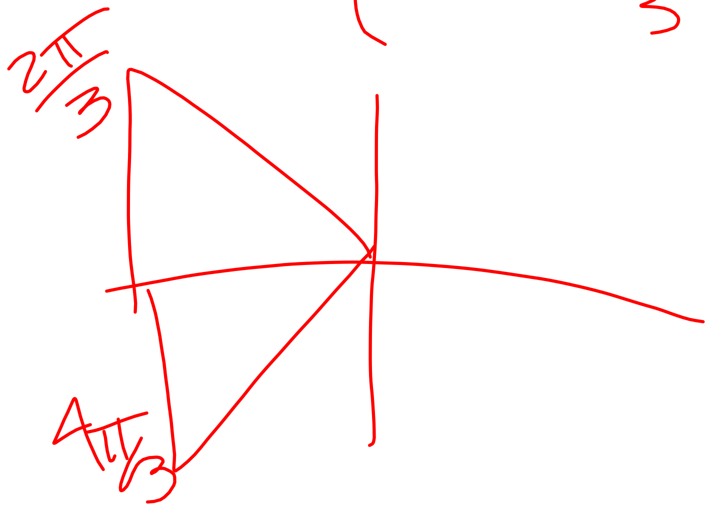


15. $\tan^{-1}\sqrt{3}$

$= \frac{\pi}{3}$



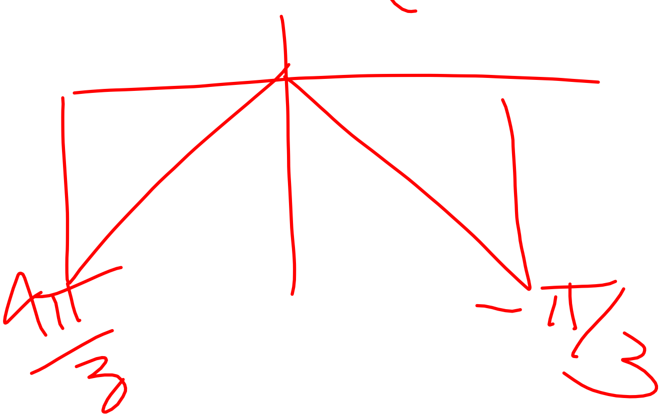
16. $\cos^{-1}\left(\cos\frac{4\pi}{3}\right) = \frac{2\pi}{3}$



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

undefined

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



20. 

$$\cot\left(\cos^{-1}\left(\frac{3}{5}\right)\right) = \boxed{\frac{3}{4}}$$

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

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

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

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

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

$$LHS = \cos^2 x - 2\sin x\cos x + \sin^2 x$$

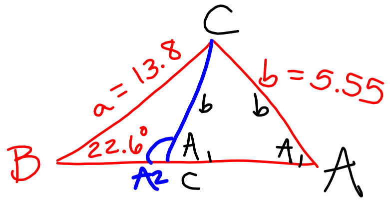
$$= 1 - \sin 2x$$

Solve the triangle.

18. $B = 22.6°$, $b = 5.55$, $a = 13.8$

ASS

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



$$\frac{\sin A}{13.8} = \frac{\sin 22.6°}{5.55}$$

$$A = \sin^{-1}\left(\frac{13\sin 22.6°}{5.55}\right) = \boxed{72.9° = A_1}$$

$$C = 180° - 22.6° - 72.9°$$

$$\boxed{C_1 = 84.5°}$$

$$\frac{c}{\sin 84.5°} = \frac{5.55}{\sin 22.6°}$$

$$c = \frac{5.55\sin 84.5}{\sin 22.6°}$$

$$\boxed{c_1 = 14.4}$$

Case 2:

$$A_2 = 180° - 72.9° = \boxed{107.1° = A_2}$$

$$C_2 = 180° - 22.6° - 107.1° = \boxed{50.3° = C_2}$$

$$\frac{c}{\sin 50.3°} = \frac{5.55}{\sin 22.6°}$$

$$c = \frac{5.55\sin 50.3°}{\sin 22.6°} = \boxed{11.1 = c_2}$$

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

$$b^2 = a^2 + c^2 - \underbrace{2ac\cos B}$$

$$\frac{\cancel{2ac}\cos B}{\cancel{2ac}} = \frac{a^2 + c^2 - b^2}{2ac}$$

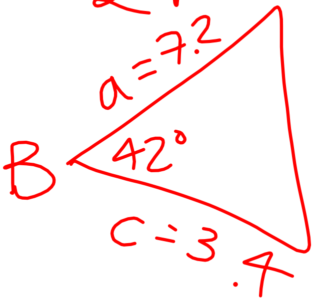
$$B = \cos^{-1}\left(\frac{a^2+c^2-b^2}{2ac}\right) = \cos^{-1}\left(\frac{12^2+20^2-14^2}{2*12*20}\right)$$

$$= \boxed{43.5^\circ}$$

Find the area of the given triangle.

7. $B = 42°$, $a = 7.2\ ft$, $c = 3.4\ ft$

$\frac{1}{2}$ product of 2 sides & sine of included angle



$$\text{area} = \frac{1}{2}(7.2)(3.4)\sin 42^\circ$$

$$= \boxed{8.2\ ft^2}$$