**Math 1392 - Trigonometry**
**Fall 2015**
**Practice Test 1 on Chapters 1 and 2**

Instructions: Calculators are allowed on this test. Each problem is worth 7 points.

1. Find smallest positive angle that is coterminal with each of the following angles:

a) $-140^o$

b) $610^o$

c) $5\pi/4$

d) $-5\pi/3$

2. Convert the following radian measures to degrees:

a) $\frac{7\pi}{6}$

b) $\frac{9\pi}{20}$

3. Convert the following degrees to radian measures:

a) $280^o$

b) $-150^o$

4. Perform the following conversions:

a) Convert 40 rev/min to radians/sec

b) Convert $90^o$/min to radians/hr

c) Convert $6\pi$ radians/hr to $^o$/min

5. A bicycle tire rotates at a rate of 3 revolution per second. What is its angular velocity in radians/minute? If the tire has a diameter of 20 inches, what is the linear velocity of the bicycle in feet/minute? (Recall: $v = \omega r$.)

6. Evaluate the following trigonometric functions using a circle chart

a) $\sin(-\pi/3)$

b) $\cos(\pi/4)$

c) $\tan(5\pi/6)$

d) $\sin(225^o)$

e) $\tan(-240^o)$

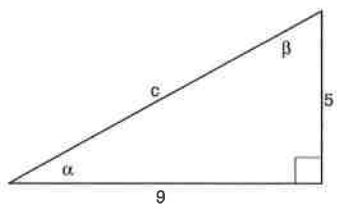
f) $\cos(120^o)$

7. Evaluate the following values by determining the value of the trigonometric functions and simplifying the result:

a) $\sin(\pi/6) * \sin(\pi/4) - \cos(\pi/6)\cos(\pi/4)$

b) $\sin(3\pi/4) * \tan(3\pi/4) + \cos(3\pi/4)$

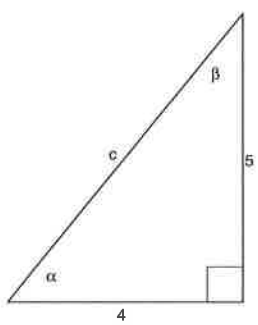
8. Determine the six trigonometric functions given the sides in the following triangles:




a)

$\cos(\alpha) =$ _____ $\sin(\alpha) =$ _____ $\tan(\alpha) =$ _____

$\sec(\alpha) =$ _____ $\csc(\alpha) =$ _____ $\cot(\alpha) =$ _____




b)

$\cos(\alpha) =$ _____ $\sin(\alpha) =$ _____ $\tan(\alpha) =$ _____

$\sec(\alpha) =$ _____ $\csc(\alpha) =$ _____ $\cot(\alpha) =$ _____

9. A person measures the angle of elevation of a tall building at $63^o$ while standing 280 feet from the base of the building. How tall is the building?

10. You and a friend are on opposite sides of the Arkansas river, directly opposite each other. Your friend walks 50 feet in a direction parallel to the river. If you measure an angle of $18^o$ between your friend's original position and your friend's new position, how wide is the Arkansas river?

11. Simplify the following expressions completely:

a) $\tan(x) - \sin(x)\sec(x)$

b) $\cos(x)\sin(x)\tan(x) + \sin(x)\cos(x)\cot(x)$

c) $\dfrac{\cos^2(x)}{1 - \sin(x)}$

12. Given that $\cos(\alpha) = 2/5$ and $\alpha$ is in Quadrant IV, determine the value of $\sin(\alpha)$ and $\tan(\alpha)$.

13. Simplify the following expression completely (The answer is one of the six trigonometric functions (i.e., $\sin(x)$, $\cos(x)$, $\tan(x)$, $\csc(x)$, $\sec(x)$ or $\cot(x)$).

$$\frac{\cot(x)}{\csc(x) - \sin(x)}$$

14. Simplify the following expression completely (The answer is one of the six trigonometric functions (i.e., $\sin(x)$, $\cos(x)$, $\tan(x)$, $\csc(x)$, $\sec(x)$ or $\cot(x)$).

$$\frac{\sin^2(x)\sec(x)}{\csc(x)} + \tan(x)\cos^2(x)$$

1.a $-140^\circ + 360^\circ = 220^\circ$

b. $610^\circ - 360^\circ = 250^\circ$

c. $5\pi/4$ ~~$-6\pi/4$~~

- This is smallest positive angle

d. $-\frac{5\pi}{3} + 2\pi$

$-\frac{5\pi}{3} + \frac{6\pi}{3} = \frac{\pi}{3}$

2a $\frac{7\pi}{6} \cdot \frac{360^\circ}{2\pi} = 210^\circ$

b. $\frac{9\pi}{20} \cdot \frac{360^\circ}{2\pi} = 81^\circ$

3a $280^\circ \cdot \frac{2\pi}{360^\circ} = \frac{14\pi}{9}$

b. $-150^\circ \cdot \frac{2\pi}{360^\circ} = \frac{-5\pi}{6}$

4a. $40 \frac{rev}{min} \cdot \frac{1\,min}{60\,sec} \cdot \frac{2\pi\,rad}{1\,rev} = \frac{4\pi}{3} \frac{rad}{sec}$

b. $\frac{90^\circ}{min} \cdot \frac{60\,min}{1\,hr} \cdot \frac{2\pi\,rad}{360^\circ} = 30\pi \frac{rad}{hr}$

c. $6\pi \frac{rad}{hr} \cdot \frac{1\,hr}{60\,min} \cdot \frac{360^\circ}{2\pi\,rad} = 180^\circ/min$

5. $\omega = 3 \frac{rev}{sec} \cdot \frac{2\pi\,rad}{1\,rev} \cdot \frac{60\,sec}{1\,min} = 360\pi \frac{rad}{min}$ $\quad r = 10\,in$

$v = \omega \cdot r = 360\pi \frac{rad}{min} \cdot \frac{10\,in}{1} \cdot \frac{1\,ft}{12\,in} = 300\pi\ ft/min$

6a. $-\frac{\sqrt{3}}{2}$

b. $\frac{\sqrt{2}}{2}$

c. $-\frac{1}{\sqrt{3}} = -\frac{\sqrt{3}}{3}$

d. $-\frac{\sqrt{2}}{2}$

e. $-\sqrt{3}$

f. $-1/2$

7a. $\frac{1}{2}\cdot\frac{\sqrt{2}}{2} - \frac{\sqrt{3}}{2}\cdot\frac{\sqrt{2}}{2} = \frac{\sqrt{2}-\sqrt{6}}{4}$

b. $\frac{\sqrt{2}}{2}\cdot(-1) - \frac{\sqrt{2}}{2} = -\sqrt{2}$

8a $c^2 = 5^2 + 9^2 = 25 + 81 = 106$

$c = \sqrt{106}$

$\cos\alpha = \frac{9}{\sqrt{106}}$ $\sin\alpha = \frac{5}{\sqrt{106}}$ $\tan\alpha = \frac{5}{9}$

$\sec\alpha = \frac{\sqrt{106}}{9}$ $\csc\alpha = \frac{\sqrt{106}}{5}$ $\cot\alpha = \frac{9}{5}$

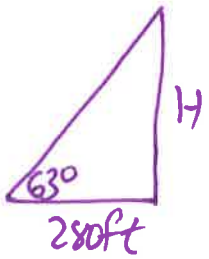
b. $c^2 = 4^2 + 5^2 = 41$

$c = \sqrt{41}$

$\cos\alpha = \frac{4}{\sqrt{41}}$ $\sin\alpha = \frac{5}{\sqrt{41}}$ $\tan\alpha = \frac{5}{4}$

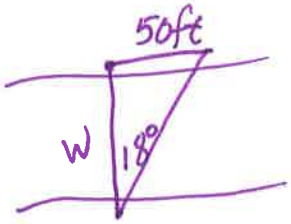
$\sec\alpha = \frac{\sqrt{41}}{4}$ $\csc\alpha = \frac{\sqrt{41}}{5}$ $\cot\alpha = \frac{4}{5}$

9.




$\tan 63° = \frac{H}{280ft}$ $H = 280ft \cdot \tan 63° \sim 550ft$

10.




$\tan 18° = \frac{50}{W}$

$W = \frac{50ft}{\tan 18°} \approx 154ft$

11. a $\tan x - \sin x \sec x$

$$\frac{\sin x}{\cos x} - \frac{\sin x}{1} \cdot \frac{1}{\cos x} = \frac{\sin x}{\cos x} - \frac{\sin x}{\cos x} = 0$$

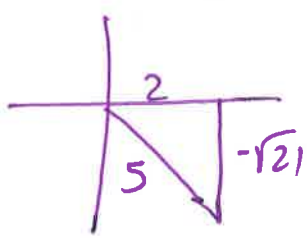
b. $$\cancel{\cos x} \cdot \sin x \cdot \frac{\sin x}{\cancel{\cos x}} + \cancel{\sin x} \cdot \cos x \cdot \frac{\cos x}{\cancel{\sin x}} = \sin^2 x + \cos^2 x = 1$$

c. $$\frac{\cos^2 x}{1-\sin x} = \frac{1-\sin^2 x}{1-\sin x} = \frac{(1-\sin x)(1+\sin x)}{1-\sin x} = 1+\sin x$$

12. $\cos\alpha = \frac{2}{5}$

$2^2 + b^2 = 5^2$

$b^2 = 21$




$\sin\alpha = \frac{-\sqrt{21}}{5}$

$\tan\alpha = \frac{-\sqrt{21}}{2}$

13. $$\frac{\cot x}{\csc x - \sin x} = \frac{\frac{\cos x}{\sin x}}{\frac{1}{\sin x} - \frac{\sin x}{1} \cdot \frac{\sin x}{\sin x}} = \frac{\frac{\cos x}{\cancel{\sin x}}}{\frac{1-\sin^2 x}{\cancel{\sin x}}} \cdot \frac{\frac{\cancel{\sin x}}{1-\sin^2 x}}{\frac{\cancel{\sin x}}{1-\sin^2 x}} = \frac{\cos x}{1-\sin^2 x}$$

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

14. $$\frac{\sin^2 x \sec x}{\csc x} + \tan x \cos^2 x = \frac{\sin^2 x \cdot \frac{1}{\cos x}}{\frac{1}{\sin x}} + \frac{\sin x}{\cos x} \cdot \frac{\cos^2 x}{1}$$

$$\frac{\frac{\sin^2 x}{\cos x} \cdot \frac{\sin x}{1}}{\frac{1}{\cancel{\sin x}} \cdot \frac{\cancel{\sin x}}{1}} + \frac{\sin x \cos^2 x}{\cos x} = \frac{\sin^3 x + \sin x \cos^2 x}{\cos x} = \frac{\sin x(\overset{1}{\cancel{\sin^2 x + \cos^2 x}})}{\cos x}$$

$$= \frac{\sin x}{\cos x} = \tan x$$