

Name _____ Date _____

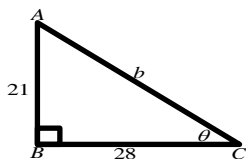
Exam Date and Time: _____

Read and answer all questions accordingly. All work and problems must be done on your own paper and work must be shown. No work = No Credit = NO EXCEPTIONS. It is worth 1.5 quiz grades.

Note: There are two parts of the exam. The NON-CALC multiple choice test has 25 questions (75 pts) & several CALC free response questions (25 pts).

Chapter 4 – Trigonometry

1) Find the following using $\triangle ABC$. Simplify to lowest terms. $b = 28, c = 21$

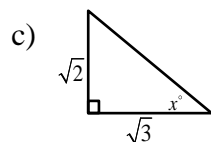
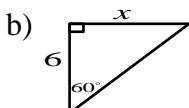
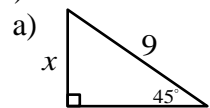


- a) $\cos \theta = \text{---}$
- b) $m\angle A = \text{---}$
- c) $\theta = \text{---}$
- d) $\sin \theta = \text{---}$
- e) $\tan \theta = \text{---}$
- f) $\sec \theta = \text{---}$
- g) $\cot \theta = \text{---}$
- h) $\csc \theta = \text{---}$

2) Find the exact value of the following when the terminal side of angle θ passes through the point $(-6, -5)$.

- a) $\cos \theta = \text{---}$
- b) $\sin \theta = \text{---}$
- c) $\tan \theta = \text{---}$

3) Solve for x



4) Convert the following:

a) Degree form		b) Radian form	
$\frac{\pi}{6} = \text{---}$	$\frac{7\pi}{12} = \text{---}$	$50^\circ = \text{---}$	$-285^\circ = \text{---}$

5) State the reference angles of the following:

- a) $225^\circ = \text{---}$
- b) $\frac{2\pi}{3} = \text{---}$
- c) $-\frac{23\pi}{4} = \text{---}$

6) Complete this statement with the proper trig function,
 $\sin 60^\circ = \text{---} \cos 30^\circ$

7) Find the exact value of the following:

- a) $\sin(3\pi)$
- b) $\cos(-270^\circ)$
- c) $\tan\left(\frac{2\pi}{3}\right)$
- d) $\sec\left(\frac{\pi}{4}\right)$
- e) $\csc\left(\frac{7\pi}{6}\right)$
- f) $\cot\left(-\frac{\pi}{6}\right)$

8) Find the amplitude, period, phase shift and vertical shift of the sine functions graphed below. The sine functions are graphed over the interval from $(-2\pi, 2\pi)$

a)	b)	c)
Amp: _____ Period: _____	Amp: _____ Period: _____	Amp: _____ Period: _____
P.S.: _____	P.S.: _____	P.S.: _____
V.S.: _____	V.S.: _____	V.S.: _____

9) Find the amplitude, period, phase shift and vertical shift of the following functions:

a) $y = 4\cos 2x + 2$

Amplitude: _____ Period: _____

Phase shift: _____ Vertical Shift: _____

b) $y = \tan\left(x - \frac{\pi}{2}\right) - 3$

Amplitude: _____ Period: _____

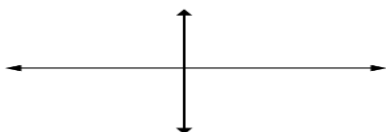
Phase shift: _____ Vertical Shift: _____

10) Identify the amplitude, period, phase shift and vertical shift of $y = 3\sin(2x + \pi) + 1$. Then, graph the function from $(-2\pi, 2\pi)$

Amplitude: _____ Period: _____

Phase shift: _____

Vertical Shift: _____



11) Write a sine function with the amplitude: 2; Period: $\frac{2\pi}{3}$; Phase shift is Left $\frac{\pi}{4}$, and Vertical shift is Up 2

12) Write a cosine function with the amplitude: $\frac{1}{2}$; Period: π ; Phase shift is Right $-\frac{\pi}{8}$, and Vertical shift is Down 4, Reflected across x -axis

13) Find the solutions of each function without a calculator.

a) $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$ b) $\cos^{-1}\left(-\frac{\sqrt{2}}{2}\right)$ c) $\tan^{-1}(-1)$

d) $\sin^{-1}(\cos(\pi))$ e) $\csc\left(\cos^{-1}\frac{\sqrt{3}}{2}\right)$ f) $\cos\left(\arcsin\frac{5}{13}\right)$

Chapter 5 – Analytical Trigonometry

1) Simplify the following:

a) $\cot x \sin x$

b) $(1 - \cos^2 x)\sec^2 x$

2) Solve each equation on the interval from $0 \leq x < 2\pi$

a) $2\cos x = -1$

b) $\cos 2x = \frac{\sqrt{3}}{2}$

c) $2\sin^2 x - \sin x - 1 = 0$

3) Use a sum/difference identity for sine/cosine to find an EXACT value for each trig expression.

a) $\sin\frac{7\pi}{12}$

b) $\cos\left(\frac{13\pi}{12}\right)$

c) $\tan\frac{5\pi}{12}$

4) Given $\cos \theta = \frac{5}{13}$ and $\frac{3\pi}{2} < \theta < 2\pi$, find the exact value of the following:

a) $\sin(2\theta)$

b) $\cos(2\theta)$

c) $\tan(2\theta)$

5) Given $\sin \theta = -\frac{12}{13}$ and $\frac{3\pi}{2} < \theta < 2\pi$, find the exact value of the following:

a) $\sin\frac{\theta}{2}$

b) $\cos\frac{\theta}{2}$

c) $\tan\frac{\theta}{2}$

6) Use half angle formulas to find the exact value of each trigonometric function.

a) $\tan\frac{\pi}{8}$

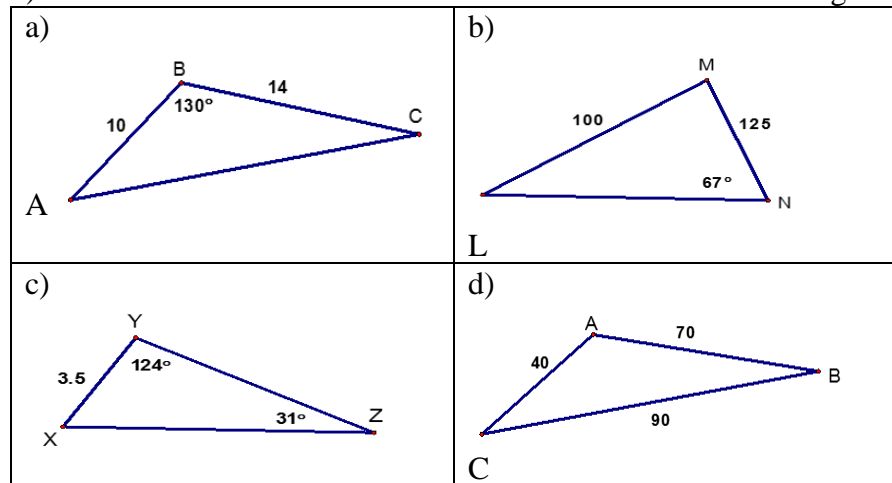
b) $\cos\frac{7\pi}{8}$

c) $\sin\frac{3\pi}{8}$

7) Find the exact value of $\sin 2x - \sin x = 0$.

Chapter 6 – Additional Topics of Trigonometry

1) Use the Law of Cosines or the Law of Sines to solve the triangle



2) Two trains leave from the same station at the same time. The angle between their two tracks is 120° . One train travels at an average speed of 45 miles per hour and the other at 70 miles per hour. How far apart are the trains after 3 hours?

3) Solve $u + v$, $u - v$, and $2u - 3v$ if $u = i + j$ and $v = 2i - 3j$.

4) Find the dot product of $u = 4i - 2j$ and $v = i - j$.

5) What is the magnitude of vector v with the initial point of $(4, -4)$ and $(-1, 6)$?

6) What is the component form of v when $\|v\| = 2$ and $\theta = 30^\circ$?

7) Determine whether $u = \langle -\frac{4}{5}, \frac{5}{2} \rangle$ and $v = \langle 16, -30 \rangle$ are parallel, orthogonal, or neither.

8) Convert to **Complex Rectangular Form**: $3\left(\cos \frac{7\pi}{6} + i \sin \frac{7\pi}{6}\right)$

9) Convert to **Complex Polar Form**: $1 - i\sqrt{3}$

10) Express your answer in **Complex Rectangular Form**:

$$\left[4\left(\text{cis } \frac{3\pi}{8}\right)\right] \cdot \left[2\left(\text{cis } \frac{\pi}{8}\right)\right]$$

11) Express your answer in **Complex Rectangular Form**:

$$\frac{6\left(\cos \frac{5\pi}{12} + i \sin \frac{5\pi}{12}\right)}{2\left(\cos \frac{\pi}{12} + i \sin \frac{\pi}{12}\right)}$$

12) Express your answer in **Complex Polar Form**:

$$\left[2\left(\cos \frac{5\pi}{6} + i \sin \frac{5\pi}{6}\right)\right]^3$$

Chapter 10: Polar Graphs

1) Eliminate the parameter and write in rectangular equation of $x = 5 \cos \theta$ and $y = 6 \sin \theta$

2) Identify the type of polar graph for each equation: *line, circle, cardioid, limaçon, rose*, etc... and sketch the graph

(a) $\theta = \frac{\pi}{6}$

(b) $r^2 = 16 \sin 2\theta$

(c) $r = 4 - 6 \cos \theta$

(d) $r = -4$

(e) $r = 3 \sin \theta - 3$

(f) $r = 4 \cos \theta + 6$

(g) $r \cos \theta = 8$

(h) $r = 6 \cos 4\theta$

(i) $r = 4\theta$

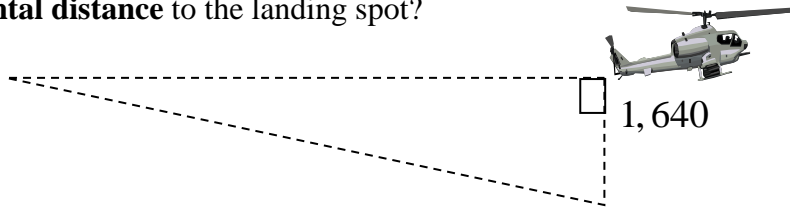
(j) $r = 6 \sin \theta$

Calculator Free Response Questions

1) Find the value of each expression correctly to 4 decimal places. If the value is undefined, state so.

a) $\csc(4.5)(\text{radians})$ b) $\sec(42.58^\circ)$

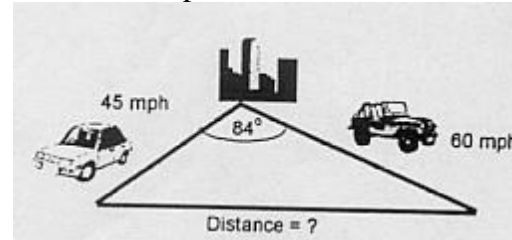
2) The pilot of a helicopter measures the angle of depression to a landing spot to be 18.8° . If the pilot's altitude is 1,640 meters, what is the **horizontal distance** to the landing spot?



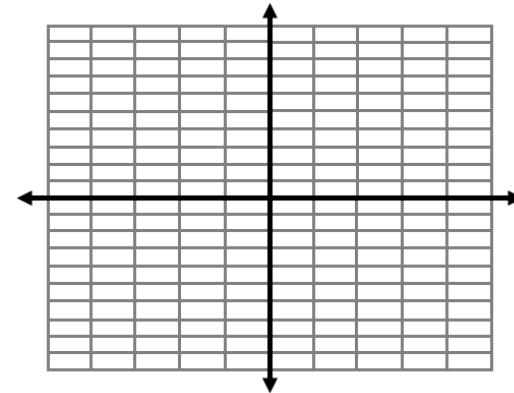
3) Show all steps and prove the following, $\frac{\tan \theta}{1 + \tan^2 \theta} = \frac{\sin \theta}{\sec \theta}$

4) Show all steps and prove the following, $\frac{\sin x}{1 + \cos x} + \cot x = \csc x$

5) Two cars leave downtown at the same time and travel along straight highways that differ in direction by 84° . If their speeds are 60 mph and 45 mph, how far apart are the cars at the end of 3 hours? Round to four decimal places and show all work.



6) Graph the parametric functions of $x = \sqrt{t}$ and $y = 5 - t$ and determine the rectangular equation from $[0,4]$



7) Use a sum and difference formula to solve $\sin \frac{11\pi}{12}$

8) List 3 ways you will do to help you study for the midterm exam.