FST Name _____

Senior Final Review

Chapters Covered: All content from chapters 4 & 5 may be on the senior final

Format: See the grid below to see how many of each type of question there will be:

	No Calculator	Calculator
Multiple Choice	15	11
Open Response	4	3

Tools: You may use the Final Reference Sheet for the entire test. You may use a graphing calculator that you bring on the second half of the exam.

1. Suppose $\cos\theta = w$ and $0 < \theta < \frac{\pi}{2}$. Find each of the following in terms of *w*:

a. $\cos(-\theta)$ = _____

b. $\cos(180° + \theta) =$ _____

c. $\cos(180° - \theta) =$ _____

d. $\cos(90° - \theta) =$ _____

2. Refer to the unit circle on the right. Which letter or combination of letters could represent the given value?

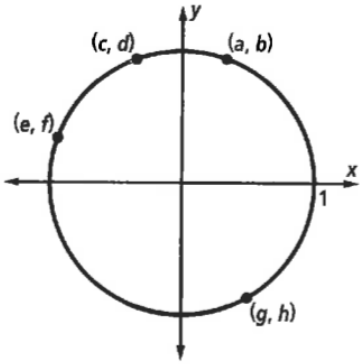
a. $\sin 70°$ _____

b. $\cos(-60°)$ _____

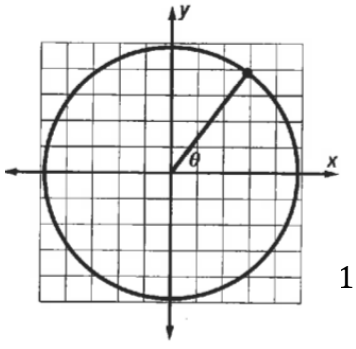
c. $\cos 110°$ _____

d. $\sin 520°$ _____

e. $\tan(-290°)$ _____



3. A unit circle is given at the right. From the diagram, estimate $\tan\theta$. Show your work.



4. If $\sin\theta = 0.78$, evaluate the following without a calculator:

a. $\sin(-\theta) =$ _____ b. $\sin(\pi - \theta) =$ _____

5. If $\cos\theta = \frac{\sqrt{17}}{7}$, use the Pythagorean Identity to find all the possible exact values of $\sin\theta$. Then use the definition of tangent to find all the possible exact values of $\tan\theta$. Show your work.

6. In which interval(s) between 0 and 2π are the sine, cosine and tangent functions all negative. All positive? Mixed? Explain your answer.

7. Find the general solutions for $6\sin^2\theta = 1 - \sin\theta$.

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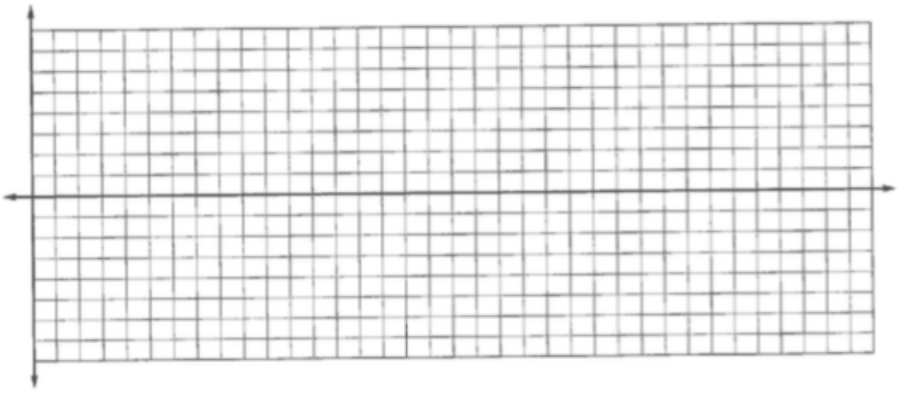
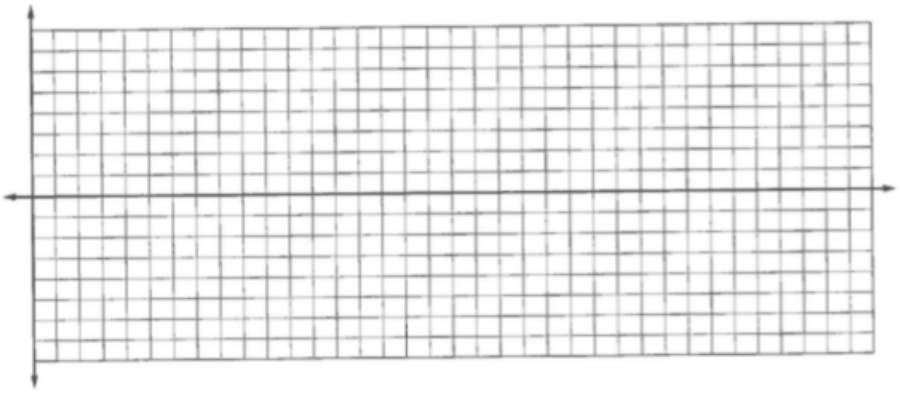
For problems #1-3, graph each function for $0° \le x \le 360°$, labeling the axes, all maximum and minimum values, and the *x*- and *y*-intercepts.

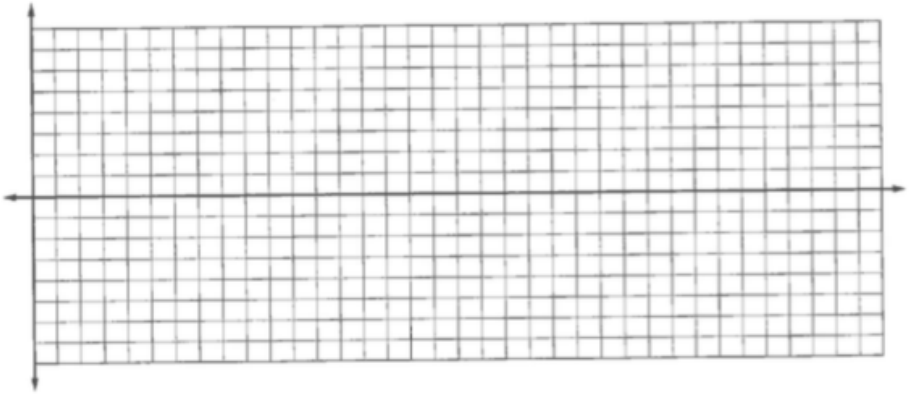
1. $y = \sin x$



2. $y = \cos x$



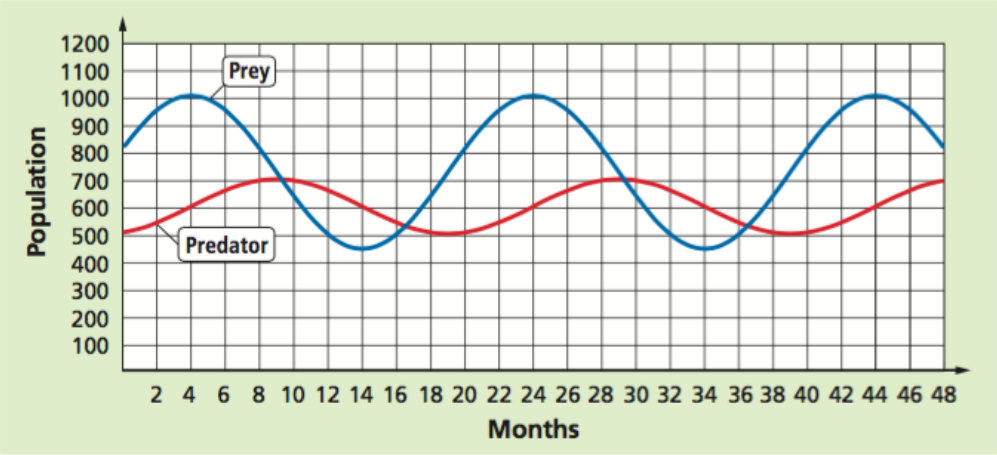
3. $y = \tan x$



4. Use the Periodicity Theorem and the unit circle to find the exact values of each. Show your work.

a. $\cos\frac{\pi}{6}$ **b.** $\sin 1575°$ **c.** $\tan 3480°$

5. Refer to the predator-prey graph below.



a. Complete the table below.

	Predator	Prey
Domain		
Period		
Maximum		
Minimum		

b. Summarize the predator-prey graph in terms of population growth and decline. Provide an explanation to the changes.

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1. The historic mean temperatures per month in Fahrenheit for Boylston, MA can be found in the table below.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Average Temp. (ºF)	24.1	28.2	35.9	47.4	57.6	67.1	72.3	70.7	62.1	50.5	40.9	30.3

a. Using your calculator, what is a sine function that describes this data? Round each value to the nearest tenth.

b. What is the amplitude? How does it relate in context?

c. What is the period? How does it relate in context?

d. What is the vertical shift?

e. What is the phase shift?

2.

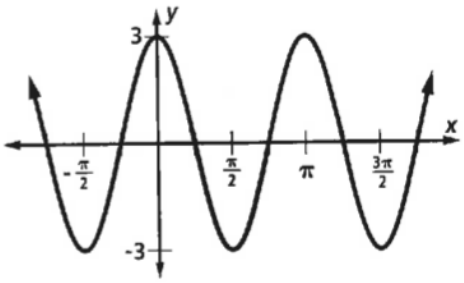
Which equation could yield the graph at the right?

A $y = 3 \sin 2x$

B $y = 3 \cos 2x$

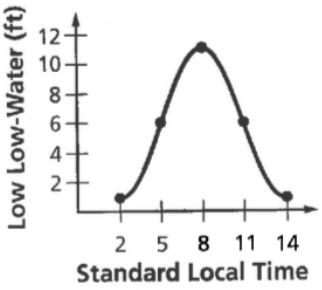
C $y = 3 \sin\left(\frac{x}{2}\right)$

D $y = 3 \cos\left(\frac{x}{2}\right)$



3. Write a function whose graph has the following characteristics: parent $y = \cos x$, phase shift $\frac{\pi}{3}$, period 4π, amplitude -3, vertical shift up 14.

4. A sine wave model for the mean low low-water level *l* for Bar Harbor, Maine, at standard local time *t* is graphed at the right. Midnight is $t = 0$. Find the following:



a. What is the amplitude? How does it relate in context?

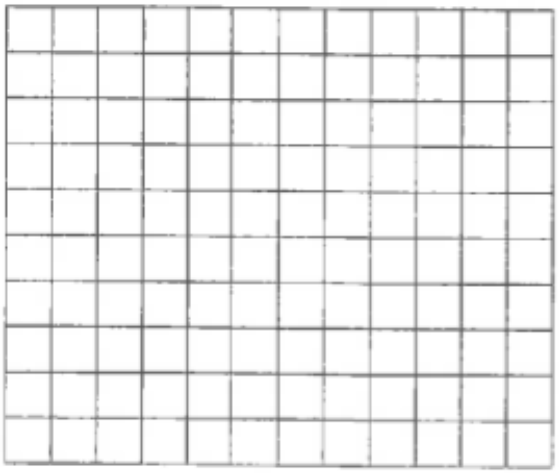
b. What is the period? How does it relate in context?

c. What is the vertical shift?

d. What is the phase shift?

e. What is a sine function that describes these data? Round each value to the nearest tenth.

5. Sketch a graph of $\frac{y-3}{2} = \cos(2x)$ by hand, identifying key points in one period of the function.



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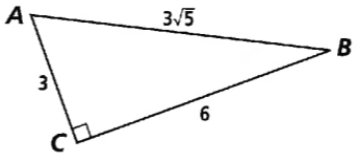
1. Complete the table by converting. Leave radians in terms of π .

Problem	a.	b.	c.
Radians	$-\frac{7\pi}{6}$		
Degrees		860º	
Revolutions			3.4 counter-clockwise

2. Refer to the triangle below.



a. Find the exact value of $\cos A$.

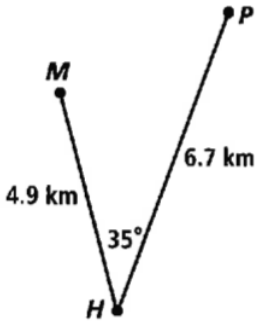
b. Find $m\angle A$ to the nearest tenth of a degree.

3. Jenny is riding in a hot air balloon and is 135 feet above the ground. The angle of depression to see her friend is 70º. How far away is she from her friend? If Jenny accidentally dropped her iFone from the balloon, about how far will her friend have to walk to retrieve the iFone?

4. The vertical displacement *d* of a mass oscillating on a spring, measured in cm, is given by the equation $d = 5\cos\left(\frac{\pi t}{2}\right)$ where *t* is the time is seconds. Solve this equation for *t*.

5. A building casts a shadow 223 ft long when the angle elevation of the Sun is 54º. How many feet high is the building? Draw and label a diagram.

6. A sign at a mountain overlook indicates that a hiker *H* is 4.9 km from a cell phone tower *M* and 6.7 km from the highest visible peak *P*. The hiker estimates the angle between *M* and *P* from her position to be 35º. Find *MP*, the distance between the tower and the peak.



7. In ΔXYZ, x = 23 cm, y = 26.5 cm and z = 32 cm. Find $m\angle Z$ and $m\angle X$.

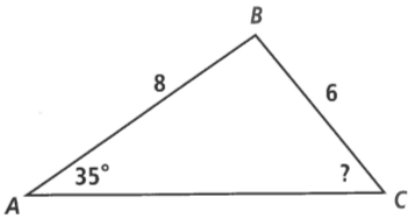
1. Find the approximate values of each expression in degrees and radians.

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

2. Compare and contrast the functions $y = \sin^{-1} x$ and $y = \tan^{-1} x$, including shape of graphs, domain and range.

3. An airplane at an altitude of 32,000 feet is ready to approach an airport for a landing. The airport is 110 miles directly ahead. What is the angle of descent the airplane must take in order to land without changing the angle? Draw and label a sketch. Then show your work.

4. Find the value of $m\angle C$ in the diagram below? Show your work.



5. Compare and contrast the Law of Sines and the Law of Cosines. Include why you chose one over the other for Problem #4, etc.

6. Two stations located on a shoreline and equipped with directional antennas intercept signals transmitted by a ship's radar. By measuring the direction of the signals, it is determined that the ship is 18º east of south from station *A* and 23º west of south from station *B*. Given that station *B* is 27 miles due east of station *A*, determine each distance to the nearest tenth of a mile. Draw and label a diagram and show your work.

a. The distance between the ship and station *A*
b. The distance between the ship and station *B*
c. The shortest distance between the ship and the shoreline, assuming a straight shoreline between the two stations.