University of Georgia **Math 1113**
Department of Mathematics **Final Exam** Fall 2016

By providing my signature below I acknowledge that I abide by the University's academic honesty policy. This is my work, and I did not get any help from anyone else:

Name (sign): _____ Name (print): _____

Student Number: _____

Instructor's Name: _____ Class Time: _____

Problem Number	Points Possible	Points Made
1	15	
2	20	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	15	
10	10	
11	15	
12	10	
13	10	
14	2	
Total:	157	

- If you need extra space use the last page.
- Please show your work. **An unjustified answer may receive little or no credit.**
- Your work must be **neat**. If I can't read it (or can't find it), I can't grade it.
- The total number of possible points that is assigned for each problem is shown here. The number of points for each subproblem is shown within the exam.
- Please turn off your mobile phone.
- You are only allowed to use a TI-30 calculator. No other calculators are permitted.

1. For each equation below determine all values of x that satisfy the equation. You should find **exact answers**. Print your answers in the box provided.

_____ (a) [5 pts] $4 = 3x^2 + 2x$.

x :

_____ (b) [5 pts] $\ln(3x + 1) = 10$.

x :

Points earned: _____
out of a possible 10 points

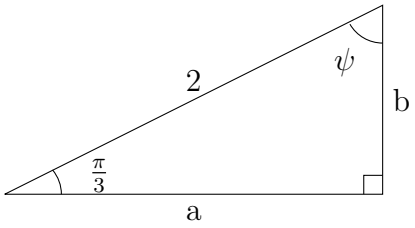
(c) [5 pts] $5e^{3x+1} = 2e^{x-1}$.

x :

Points earned: ____
out of a possible 5 points

2. For each problem below determine the values of the missing quantities. All angles are in radians, and your answers for angles should be in radians. (The triangles are not drawn to scale.) Provide exact answers.

(a) [10 pts]

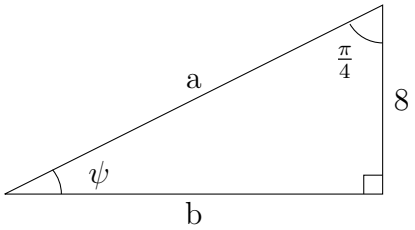


$a =$ _____

$b =$ _____

$\psi =$ _____

(b) [10 pts]



$a =$ _____

$b =$ _____

$\psi =$ _____

Points earned: _____
out of a possible 20 points

3. [10 pts] Determine the radius and the center of the circle given by

$$x^2 + 2x + y^2 - 3y = 3.$$

Print your answers in the box at the bottom of the page.

radius:	Center:

Points earned: ____
out of a possible 10 points

4. [10 pts] Determine the inverse function for

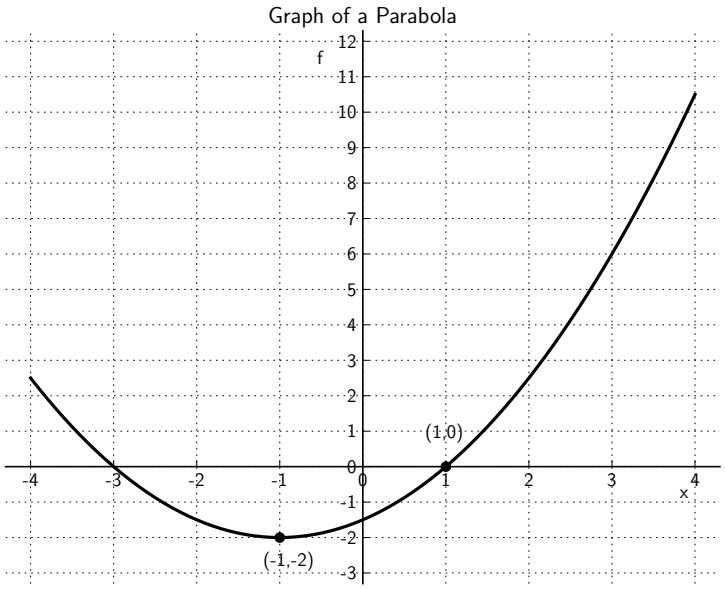
$$f(x) = 5e^{8x}.$$

Print your answer in the box at the bottom of the page.

Inverse function:

Points earned: ____
out of a possible 10 points

5. [10 pts] Determine the equation of the parabola shown in the figure below. Print your answer in the box at the bottom of the page.



Equation:

Points earned: ____
out of a possible 10 points

6. [10 pts] Determine all of the values of θ that satisfy

$$\sin(\theta)\cos(\theta) - \frac{1}{2}\sin(\theta) \;=\; 0.$$

Print your answer in the box at the bottom of the page. (Indicate all solutions using an integer denoted by n.)

θ :

Points earned: ____
out of a possible 10 points

7. [10 pts] A company that produces tires will start ten lines, and each line normally produces 500 tires per day. On the first day, though, each line will only produce 100 tires. Determine the function that represents the total number of tires produced at the end of a given day since the start of production. (Day 1 is the end of the first day of production.) Print the function in the box at the bottom of the page.

Number of tires:

Points earned: ____
out of a possible 10 points

8. A chemical degrades over time, and the amount of chemical present in a sample is an exponential function. The half-life of the chemical is 6 years. Answer each of the questions below. **Provide an exact answer or a numerical value rounded to 1 decimal place. Print your answers in the boxes provided.**

(a) [5 pts] How long will it take until the amount of the chemical in a package is reduced to 20% of its original amount?

Length of time (years):

(b) [5 pts] A package is found that has 5g of the chemical. If the package is 8 years old how much of the chemical was in the package at the initial time?

Initial amount (g):

Points earned: ____
out of a possible 10 points

9. The Space Ghost is preparing to visit an evil villain on a distant planet X. Prior to arriving he sends a satellite to get information about the planet. The satellite returns information about the temperature (in Fahrenheit) on the surface of the planet,

$$\text{Temperature(t)} \;=\; 45\sin\left(\frac{\pi}{15}t\right) + 10,$$

where t is measured in hours on planet X. Assume that the daily cycle on planet X is similar to Earth's daily cycle.

(a) [5 pts] What is the minimum and maximum daily temperatures?

Minimum _____

Maximum _____

(b) [5 pts] How long is one day on this planet in hours?

(c) [5 pts] The formula to convert Fahrenheit to Celsius is

$$C(F) \;=\; \frac{5}{9}(F - 32).$$

Determine the equation for the hourly surface temperature in Celsius.

Points earned: ____
out of a possible 15 points

10. [10 pts] The tallest tree in Kansas is estimated to be 125 feet tall. A person will take a picture of the tree. The camera will be held 5 feet above the ground, and it will be pointed in a horizontal direction. The angle of elevation for the top edge of the camera's picture is 50°. How far away from the base of the tree must the person be to get the top of the tree in the picture? (Assume that Kansas is relatively flat.) Print your answer in the box below. **Provide an exact answer or a numerical value rounded to 1 decimal place. Print your answers in the boxes provided.**

Distance:

Points earned: ____
out of a possible 10 points

11. The estimated height of a tree in meters is given by

$$h(t) = \frac{50}{1 + 49e^{-2t}},$$

where t is the number of years from the start of observations. Print your answers in the boxes were given below. Provide an exact answer or a numerical value rounded to 1 decimal place. Print your answers in the boxes provided.

_____ (a) [5 pts] What was the initial height of the tree at the start of the observations?

Height:

_____ (b) [5 pts] When will the height be double the initial height?

Time:

_____ (c) [5 pts] What height will the tree approach after a very long time? (Explain how you arrived at your conclusion in one or two sentences.)

Points earned: _____
out of a possible 15 points

12. [10 pts] Is the equation

$$\cos(\theta) + \sin(\theta)\tan(\theta) \quad = \quad \sec(\theta),$$

an identity? If so show the steps necessary to verify that it is an identity. If it is not an identity provide an example the demonstrates that it is not an identity.

Points earned: ____
out of a possible 10 points

13. For each value below determine the exact value. Show your work and do not simply use the value returned by a calculator. Print your result in the box provided.

_____ (a) [5 pts] $\sin(\arctan(4))$.

Value:

_____ (b) [5 pts] $\cos\left(\arcsin\left(\frac{1}{3}\right)\right)$.

Value:

14. [2 pts] How well do you think your score will compare to the other students? Circle the percentage below that corresponds to your rank. A 100% means that you will have the best score, a 0% is the worst, and a 50% means that your score will be in the middle of all of the scores.

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

Extra space for work. **Do not detach this page.** If you want us to consider the work on this page you should print your name, instructor and class meeting time below.

Name (print): _____ Instructor (print): _____ Time: _____

Points earned: ____
out of a possible 0 points