MATH 2250

Final Exam: Part I

July 1, 2014

NAME (please print legibly): _____

Your University ID Number: _____

A correct answer obtained using an incorrect or poorly explained procedure will not be graded for full credit. Please feel free to write as much as you like. Work carefully, and try to complete the problems you find easier before going back to the harder ones. Good luck!

Remember that you are **strongly encouraged** to have a non-graphing calculator to complete the exam. Remember also that smartphone (or computer, or other device) use is **prohibited** on this exam, regardless of what you use it for.

This is Part I of the exam. Please remember to work **slowly** and **carefully** and write down each step as you proceed through the problems. When you're done this part of the exam, please hand it in and take a brief coffee and walking break before picking up and starting part II of the exam.

QUESTION	VALUE	SCORE
1	10	
2	10	
3	15	
4	10	
5	10	
TOTAL	55	

1. (10 points) Compute the limit

$$\lim_{x \to 1} \frac{\sin(1 - \sqrt{x})}{x - 1}$$

using any method you like.

ANSWER: _____

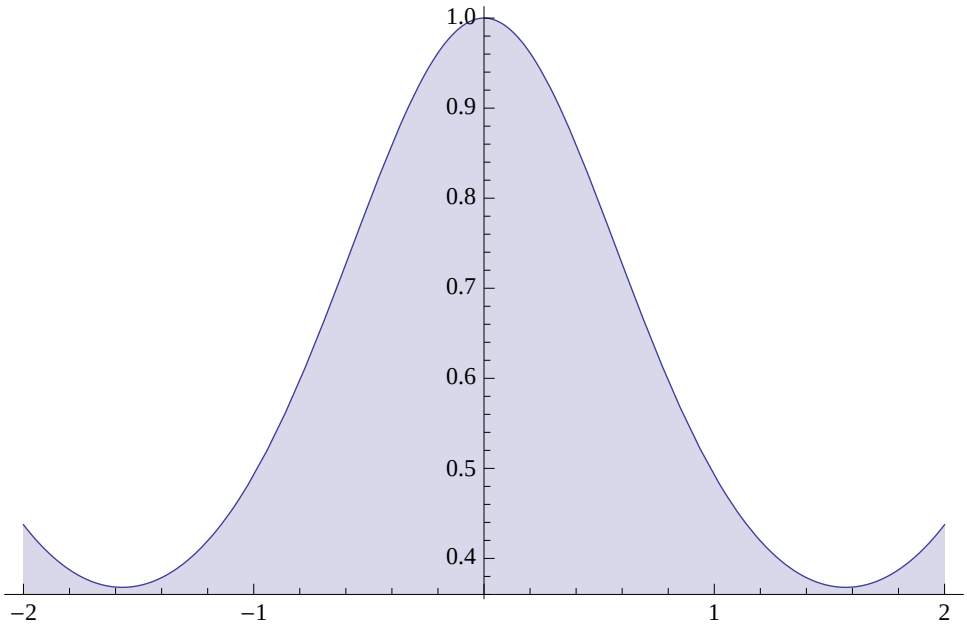
2. (10 points) Find the derivative of

$$f(x) = \sqrt{x} \tan (x + 1)^3$$

ANSWER: _____

3. (15 points) A plot of the function $y = f(x)$ appears below. Please label

- The point(s) on the plot where $f'(x)$ is largest (most positive).
- The point(s) on the plot where $f'(x)$ is smallest (most negative).
- Any critical points on the plot.



4. (10 points) The MegaBus holds at most 60 people. The fare charged for the ride p and the number of passengers x are related by the equation

$$p(x) = (3 - x/40)^2$$

The total revenue for the bus company is given by the number of passengers x multiplied by the price p. That is, $r(x) = xp(x)$. Find the maximum value of $r(x)$, the corresponding number of passengers x, and the price $p(x)$ which realizes this maximum revenue. Write a one-sentence conclusion about the business model of MegaBus, Inc.

ANSWER: _____

5. (10 points) Suppose that

$$x \arcsin y = 1 + xy^2$$

Find $\frac{dy}{dx}$ using implicit differentiation.

ANSWER: _____