November 7th, 2014

Math 141

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Fall 2014

Name: ....

Student ID (last 6 digits): XXX-................

TA recitation (check one):

James Scott: ☐ Margaret Wieczorek: ☐
Andrew Starnes: ☐ John Cummings: ☐

Midterm 2

You have 50 minutes to complete the exam. Do all work on this exam, i.e., on the page of the respective assignment. Indicate clearly, when you continue your solution on the back of the page or another part of the exam.

Write your name and the last six digits of your student ID number on the top of this page. Check that no pages of your exam are missing. This exam has 6 questions and 10 printed pages (including this one and a page for scratch work in the end).

No books, notes or calculators are allowed on this exam!

Show all work! (Unless I say otherwise.) Correct answers without work will receive **zero**. Also, **points will be taken from messy solutions**.

Good luck!

Question	Max. Points	Score
1	20	
2	15	
3	15	
4	15	
5	15	
6	20	
Total	100	

1) Compute the derivatives of the following functions. [**No need to simplify your answers!**]

(a) [6 points] $f(x) = \sqrt{x} \cdot \ln(\cos(x))$

(b) [7 points] $f(x) = \dfrac{x^2}{x \cdot \mathrm{e}^x + 1}$

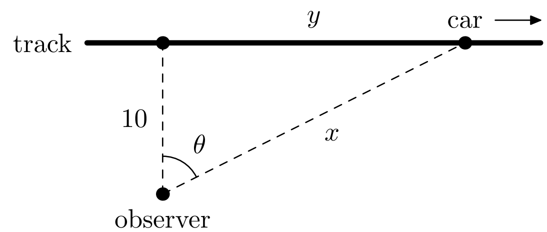
(c) [7 points] $f(x) = x^{\arcsin(x)}$. [**Note:** $\arcsin(x)$ is the same as $\sin^{-1}(x)$.]

2) [15 points] Find the equation of the line tangent to the curve given by

$$x^2 + y^2 = xy^3 + 1$$

at the point $(0, -1)$.

3) [15 points] An observer watches a racing car pass by on a straight track 10 meters away. [See picture below.] If the observer is turning his head at a rate of 1 radian per second when his distance to the car [labeled x in the picture below] is 20 meters, how fast is the car moving at that instant?



4) [15 points] Use the tangent line approximation to estimate $\ln(1.1)$. Also, give the percentage error for the approximation. [**Note:** You can leave computations and log's indicated in the second part, but the first part must be a simple number.]

5) [15 points] Find [absolute] maximum and minimum [*both* x-coordinate and corresponding value of the function] of $f(x) = -x + 3\sqrt[3]{x}$ in the interval $[-1, 8]$.

6) [20 points] Let $f(x) = 2x^3 - 3x^2 - 12x + 6$. [**Note:** In all items below you can use "DNE" for "does not exist".]

(a) Give the intervals in which $f(x)$ is increasing and the intervals in which it is decreasing.

(b) Give all critical points [x-coordinate only] and classify them as local maximum, local minimum or neither.

Continues on next page!

(c) Give all intervals in which the graph of the function $f(x)$ is concave up and all intervals in which it is concave down.

(d) Give all inflection points [x-coordinate only] of $f(x)$.

Scratch: