April 4th, 2012

Math 141

Luís Finotti
Spring 2012

Name: .....

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

TA recitation (check one):

Chelsea McAmis:	☐	Joshua Mike:	☐
Tim Krumwiede (11:15):	☐	Tim Krumwiede (12:40):	☐

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 5 questions and 8 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	15	
2	15	
3	15	
4	15	
5	40	
Total	100	

1) [15 points] If $f(x) = \ln(\cos(x^2))$, compute $f''(x)$.

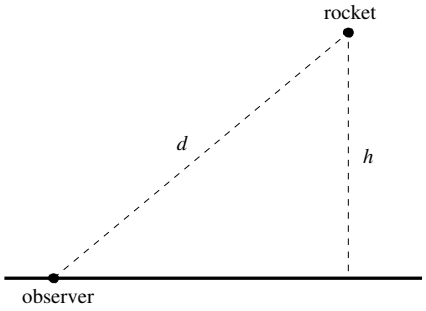
[**Note:** I am asking for the *second* derivative!]

2) [15 points] Find an approximation for arctan(1.1). What is the percentage error in this case?

[**Note:** Remember that I use arctan(x) for what the book denotes by $\tan^{-1}(x)$. In other words, the book would ask for approximation of $\tan^{-1}(1.1)$.]

3) [15 points] Find the equation of the line tangent to the curve $x^2 + \sin(y) = xy^2 + 1$ at the point $(1, 0)$.

4) [15 points] An observer (on the ground) is 3 miles away from the take-off point of a rocket, which is moving straight up with a speed of 300 miles per hour. (See the picture below.) How fast is the distance between the observer and the rocket increasing when the rocket is 4 miles high?



5) Let $f(x) = x^3 - 12x + 1$.

(a) [10 points] Find where $f(x)$ is increasing and where it is decreasing.

(b) [10 points] Find where $f(x)$ is concave up and where it is concave down.

(c) [10 points] Find the x-coordinate of all inflection points and local maxima and minima of $f(x)$.

(d) [10 points] Find the *global* maximum and minimum of $f(x)$ in the interval $[-3, 5]$, also indicating for which value(s) of x they occur.

Scratch: