# Math 1271-002 (Calculus 1). Spring 2015.

Midterm Exam 2

Name:_____

1. **Do not open this exam until you are told to do so.**

2. This exam has 6 pages including this cover. There are 5 problems.

3. Not all problems are of equal difficulty, so you may want to skip over and return to a problem on which you are stuck.

4. Do not separate the pages of this exam. If they do become separated, write your name on every page and point this out to your instructor when you hand in the exam.

5. Show an appropriate amount of work for each problem.

6. You may (but do not need to) use a scientific calculator.

7. No notecards are allowed.

8. **No cell phones, smartphones, headphones, or other devices allowed.**
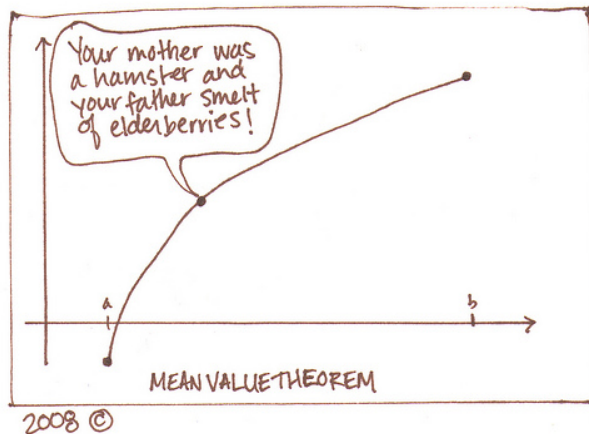
1	
2	
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5	
Total	

Problem 1. a. (5 points) Find the absolute minimum and maximum of $x^3 - 6x^2 + 9x + 17$ on the interval $[0, 2]$.

b. (5 points) Use linearization to approximate $\sqrt[3]{8.12}$. Is your answer an overestimate or an underestimate? Make sure to provide sufficient explanation.

Problem 2. (10 points) Coffee is dripping through a conical filter such that the height of the filter is equal to the radius of the base. The coffee drips at a rate of 3 in^3 per minute. When that height of the coffee is 2 inches, at what rate is the height decreasing? (You may need the formula for the volume of a cone of height h and base radius r; it is $V = \frac{1}{3}\pi r^2 h$).

Problem 3. Find $y' = \frac{dy}{dx}$ if

a. (3 points) $y = \ln(x) \arctan(1 + x^2)$

b. (3 points) $\sin(xy) = x^2 + y^2$

c. (4 points) $y = x^{\cos(x) - 1}$

Problem 4. Find the limits

a. (2 points) $\displaystyle\lim_{x\to\pi/2}\frac{\sin(3x)}{\cos(2x)}$

b. (2 points) $\displaystyle\lim_{x\to\pi/2}\frac{\sin(2x)}{\cos(3x)}$

c. (3 points) $\displaystyle\lim_{x\to0^+}\sin(x)\ln(x)$

d. (3 points) $\displaystyle\lim_{x\to0^+}x^{\sin(x)}$

Problem 5. (10 points) If $f'(x) \geqslant 4$ for all x, and $f(3) = 4$, how large can $f^{-1}(5)$ be?