Midterm Exam II

Spring 2014, MAT175 Section B401[51350]

May 1st, 2014. 9:00AM–10:40AM.

Instructions: Print your name on the exam booklet. This exam is closed-book and closed-note. You cannot use any electronic device in this exam. You are not allowed to talk to other students. Write all details explicitly. Answers without justifications and/or calculation steps may receive no score. Hand-in blue booklet only, and keep the exam paper for your study.

Part I — 5 points each, total 40 points

1.(Sample Final I-4) Determine the slope of the tangent line to the graph of the equation $4x^2+9y^2 = 25$ at the point $(2, 1)$.(5 Points) *Hint: Implicit differentiation*

2.(Sample Final I-5) Compute the derivative $\frac{dz}{dx}$ of the function $z = x^3e^{3x}$.(5 Points)

3.(Sample Final I-6) Compute the derivative $P'(l)$ of the function $P(l) = \ln(l^2 + \sin l)$.(5 Points)

4.(Sample Final I-10) If the area $A(a) = \frac{\sqrt{3}}{4}a^2$ of an equilateral triangle is increasing at the constant rate 3 square inches per second, how fast is the length a of the sides increasing when the area is $4\sqrt{3}$ square inches?(5 Points)

5.(Sample Final II-9) Find the limit:(5 Points)

$$\lim_{x\to\infty} \frac{2x^2 + x + 2}{3x^2 - x + 1}.$$

6.(Sample Final I-7) Find the limit:(5 Points)

$$\lim_{t\to\infty} \frac{\cos t}{1 - e^t}.$$

7.(Sample Final II-9) Find the limit:(5 Points)

$$\lim_{x\to\infty} \frac{2013x^3 + 2014x^2 + 2015x + 2016}{2013x^3 + 2012x^2 + 2011x + 2010}.$$

8.(Sample Final II-9) Find the limit:(5 Points)

$$\lim_{x\to\infty} \frac{x + \frac{1}{x}}{x^2 - \frac{1}{x^2}}.$$

Part II — 10 points each, total 60 points

9.(Sample Final I-13) Find the absolute maximum and minimum *values* of $f(x) = 2x^3 - 4x^2$ on the closed interval $[-1, 2]$.(10 Points)

10.(Sample Final I-13) Find the absolute maximum and minimum *values* of $f(x) = x^3 - x^2$ on the closed interval $[0, 1]$.(10 Points)

11.(Sample Final I-14) Find all relative extrema of $F(x) = x^4 + 5x^2 + 6$.(10 Points)

12.(Sample Final I-14) Find all relative extrema of $F(x) = 2x + \frac{2}{x}$.(10 Points)

13.(Sample Final I-11) Find where the graph of $y = -x^3 + x^2 + 2x - 1$ is concave up and concave down, and find all inflection points.(10 Points)

14.(Sample Final I-11) Find where the graph of $y = x^3 - x^2$ is concave up and concave down, and find all inflection points.(10 Points)

Hints: #8. You may wish to factor $x^2 - \frac{1}{x^2}$ first.
#9. $f(\frac{4}{3}) = -\frac{4^3}{3^3} > -6$.