Midterm Exam II Practice Test
Spring 2014, MAT175 Section B401[51350]

Instructions: Write all details explicitly. Answers without justifications and/or calculation steps may receive no score.

Part I — There will be 8 problems in actual exam.[1]

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

2.(Sample Final I-5) Compute the derivative $\frac{dA}{d\theta}$ of the function $A(\theta) = \theta e^\theta \cos\theta$.(5 Points)

3.(Sample Final I-6) Compute the derivative $Q'(\pi)$ of the function $Q(\pi) = \cos(\sin(\pi^2))$, where π is a variable and NOT a constant $\pi = 3.141592....$(5 Points)

4.(Sample Final I-10) If the volume $V(a) = \frac{\sqrt{2}}{12}a^3$ of an expanding equilateral tetrahedron with the length a of sides is increasing at the constant rate of 120 cubic inches per second, how fast is the length a increasing when the volume is $\frac{2\sqrt{2}}{3}$ cubic inches?(5 Points)

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

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

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

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

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

$$\lim_{t\to\infty} \frac{\cos t}{e^{2t} + 1}.$$

8.(Sample Final I-7) Find the limit: $\lim_{t\to-\infty} e^t \sin 2t$.(5 Points)

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

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

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[1]4 problems in the types of #1 to #4, and 4 problems on infinite limits

10.(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 — 6 problems will appear in the second midterm identically!

11.(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)

12.(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)

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

14.(Sample Final I-14) Find all relative extrema of $F(x) = x^3 - x^2$.(10 Points)

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

16.(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)

17.(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)

18.(Sample Final I-11) Find concavity and inflection points of the graph of $y = x^4 - 4x^3$.(10 Points)

19.(Sample Final 18) Sixty meters of fencing are to be used to enclose a rectangular garden. Find the dimensions that will give the maximum area.(5 points)

20.(Sample Final 18) The revenue from the sale of x items is $R(x) = 800x - 2x^2$ dollars and the cost to produce these x items is $C(x) = 2x^2 + 1000$ dollars. How many items should be produced to maximize profit?(5 points)