

110.108 CALCULUS 1
FALL 2013
MIDTERM 2

Name: _____

Recitation section:

- ___ 1. Tuesday 1:30 (V. Allard)
- ___ 2. Tuesday 3:00 (J. Jun)
- ___ 4. Thursday 4:30 (D. Ginsberg)
- ___ 5. Thursday 3:00 (D. Ginsberg)

Work quickly and carefully, and write your solutions clearly. Please show your work; partial credit will be given generously.

Statement of ethics

I agree to complete this exam without unauthorized assistance from any person, materials, or device.

Signature: _____ Date: _____

Problem	Score
1	/12
2	/10
3	/10
4	/10
5	/10
TOTAL	/52

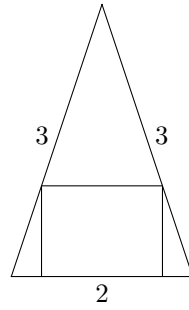
Problem 1 (12 points). Find the following.

(a) $\int (1 - 3x^2)(1 + 3x^2) dx$

(b) $\int_1^2 \left(\frac{x}{2} - \frac{2}{x} \right) dx$

(c) An equation for the tangent line to the graph of $y = x^{\sin(\pi x)}$ at the point $(1, 1)$.

Problem 2. [10 points] Find the dimensions of the rectangle of largest area that can be inscribed in an isosceles triangle of base 2 and other sides of length 3, where one side of the rectangle is along the base.



Problem 3. [10 points] As a spherical ball of ice melts, its surface area is decreasing at a rate of 2 cm^2 per minute. What's the rate of change of the radius of the ball when the radius is 5 cm? (HINT: Be careful with your signs! Also, the area of a sphere of radius r is $4\pi r^2$.)

Problem 4. [10 points] Let

$$f(x) = \int_0^x e^{-t^2} dt.$$

Find all local maxima, local minima, and inflection points of f (if any), and where f is increasing and decreasing.

Problem 5. [10 points]

(a) What is wrong with the following application of L'Hôpital's Rule? What should the limit really be?

$$\lim_{x \rightarrow 1} \frac{x^3 + x - 2}{x^2 - 3x + 2} = \lim_{x \rightarrow 1} \frac{3x^2 + 1}{2x - 3} = \lim_{x \rightarrow 1} \frac{6x}{2} = 3$$

(b) Evaluate $\lim_{x \rightarrow 0} \frac{1}{x^2} \int_0^x \sin(t^2) dt$.