

Midterm Exam 1, Wednesday, Feb 14, 2007
Lev Borisov, Math 221, Lecture Section 1

**DO NOT OPEN THE EXAM
BEFORE THE START
ANNOUNCEMENT !**

Please write your name and your TA's name below.

Name:

TA:

Each problem is worth 20 points, for a total of 100 points. **Calculators are not allowed on this test.** Please read each question carefully, it also helps to check afterwards that you have answered each part of each question. **You must show all your work to receive credit.** When you turn in your paper after the test, make sure the TA checks your name in their list or writes your name down. Good luck!

1	2	3	4	5	Total

[1] Sketch the graph of the function $f(x) = 2\sin(\pi x) + 1$. What is the period of this function?

[1] (20 pts)

Please leave blank!

[2] Calculate the following limits.

(a)[10pts]

$$\lim_{x \rightarrow +\infty} \frac{x^3 + \sin x}{(x^2 + 1)(2x + 1)}$$

(b)[10pts]

$$\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2}$$

Hint: Multiply numerator and denominator by $1 + \cos x$. *You are not allowed to use L'Hospital's Rule for this exam.*

[2] (20 pts)

Please leave blank!

[3] For which values of c is the function

$$f(x) = \begin{cases} x^2, & x \geq c \\ 2 + x, & x < c \end{cases}$$

continuous for all x ? You must justify your answer.

[3] (20 pts)

Please leave blank!

[4] Use the definition of derivative as a limit to find the equation of the tangent line to the curve $y = x^2 + x$ at the point $(-3, 6)$.

[4] (20 pts)

Please leave blank!

[5] Let $f(x)$ be a function, which is differentiable at x_0 . Consider the function

$$g(x) = f(x)^2.$$

Use the definition of derivative as a limit to show that

$$g'(x_0) = 2f(x_0)f'(x_0).$$

Remark: This is a particular case of the Chain Rule. However, *you are not allowed to use the Chain Rule to solve this problem.*

[5] (20 pts)

Please leave blank!