
KOÇ UNIVERSITY
MATH 106 - CALCULUS I
Midterm I October 22, 2014

Duration of Exam: 75 minutes

INSTRUCTIONS: CALCULATORS ARE NOT ALLOWED FOR THIS EXAM. No books, no notes, no questions and no talking allowed. You must always **explain your answers** and **show your work** to receive **full credit**. Use the back of these pages if necessary. **Print (use CAPITAL LETTERS) and sign your name, and indicate your section below.**

Surname, Name: _____

Signature: _____

Section (Check One):

- Section 1: E. Ş. Yazıcı (Mon-Wed 16:00) _____
Section 2: E. Ş. Yazıcı (Mon-Wed 13:00) _____
Section 3: Doğan Bilge (Mon-Wed 11:30) _____
Section 4: Doğan Bilge (Mon-Wed 14:30) _____
Section 5: Altan Erdoğan (Tu-Th 16:00) _____

PROBLEM	POINTS	SCORE
1	40	
2	16	
3	15	
4	15	
5	15	
TOTAL	101	

1. Compute the following limits if they exist. You are not allowed to use the L'Hospital Rule. Specify any infinite limits.

a) (8 points) $\lim_{x \rightarrow 0} \frac{\sqrt{\cos x + x^2} - \sqrt{\cos x - x^2}}{\sin^2 x} =$

b) (8 points) $\lim_{x \rightarrow 0} \frac{1}{|x - 1| - |x + 1|} =$

c) (8 points) $\lim_{x \rightarrow \infty} \frac{x - x^3}{x^2 + 5} =$

d) (8 points) $\lim_{x \rightarrow 1} \frac{x+1}{1-x^4} =$

e) (8 points) $\lim_{x \rightarrow 1} \frac{\ln x}{x-1} =$

2. Differentiate the following functions. (Note: $\sin^{-1} x = \arcsin x$)

a) (8 points) $f(x) = \ln \frac{\sin(2x)}{\sin^{-1} x}$

b) (8 points) $f(x) = \cos(2^{x^2})$

3. (15 points) Let $f(x) = e^x$ and $g(x) = \sin(\ln x)$. Find equations for two distinct parallel lines l_1 and l_2 where; l_1 is tangent to f at $x = 0$ and l_2 is tangent to g .

4. (15 points) Show that there exist a sphere with radius $r \in (0, 1)$ and a cube with side $r + \frac{1}{2}$ with the same volume. (Volume of the sphere with radius r is $\frac{4}{3}\pi r^3$, and the volume of a cube with side a is a^3).

5. (15 points) Let $x > 0$. Find y' using implicit differentiation if $x^y + y - 1 = 0$.