KOÇ UNIVERSITY

MATH 106 - CALCULUS I

Final Exam January 6, 2014

Duration of Exam: 120 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):

Lecture 1 (Haluk Oral	–	MW 14:00-15:15)	:	—
Lecture 2 (Selda Küçükçifçi	–	MW 11:00-12:15)	:	—
Lecture 3 (Selda Küçükçifçi	–	MW 12:30-13:45)	:	—
Lecture 4 (Haluk Oral	–	MW 15:30-16:45)	:	—

PROBLEM	**POINTS**	**SCORE**
1	35	
2	7	
3	10	
4	7	
5	21	
6	7	
7	7	
8	12	
TOTAL	**106**	

1. Evaluate the integrals in (a)-(e).

(a) (7 points) $\displaystyle\int \frac{5+2x}{(1+x)^2}dx$

(b) (8 points) $\displaystyle\int_1^{e^2} \frac{5+2\ln x}{x(1+\ln x)^2}dx$

(c) (6 points) $\int \arcsin x dx$

(d) (6 points) $\int \cos^3 x dx$

(e) (8 points) $\displaystyle\int_1^{\sqrt{2}} \frac{dx}{x^2\sqrt{4-x^2}}$

2. (7 points) Use a linear approximation to estimate $(2.001)^5$.

3. (10 points) Find absolute maximum and absolute minimum points of the function

$$f(t) = t(4 - t^2)^{3/2} \quad \text{in} \quad [-1, 2].$$

4. (7 points) Suppose f is an odd function and is differentiable everywhere. Prove that for every positive number b, there exists a number c in $(-b, b)$ such that $f'(c) = f(b)/b$.

5. Determine whether the following improper integrals are convergent or divergent.

(a) (7 points) $\displaystyle\int_0^\infty \frac{dx}{2x+1}$

(b) (7 points) $\displaystyle\int_0^\infty \frac{e^x}{2x+1}dx$

(c) (7 points) $\int_1^4 \frac{1}{x-3} dx$

6. (7 points) Find a function f and a number a such that $6 + \int_a^x \frac{f(t)}{t^2}\, dt = 2\sqrt{x}$ for all $x > 0$.

7. (7 points) Find the area of the region bounded by $y = x + 1$ and $y = (x - 1)^2$.

8. (12 points) Let R be the region enclosed by $y = \sin x$, $y = 1$, $x = 0$ and $x = \pi$. Calculate the volume of the solid obtained by rotating R around $y = 1$.