
KOÇ UNIVERSITY
MATH 101 - FINITE MATHEMATICS
Final Exam January 8, 2008

Duration of Exam: 140 minutes

INSTRUCTIONS: CALCULATORS ARE 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: S. Küçükçifçi (Tue-Thu 11:00) _____
Section 2: S. Küçükçifçi (Tue-Thu 14:00) _____
Section 3: M. Sarıdereli (Mon-Wed 14:00) _____
Section 4: M. Sarıdereli (Tue-Thu 11:00) _____
Section 5: E. Ş. Yazıcı (Tue-Thu 12:30) _____

PROBLEM	POINTS	SCORE
1	25	
2	25	
3	20	
4	20	
5	10	
6	32	
7	18	
TOTAL	150	

1. Find the following limits if they exist. Specify any infinite limits.

(a) (5 points) $\lim_{r \rightarrow 9} \frac{\sqrt{r}}{(r-9)^4}$

(b) (5 points) $\lim_{x \rightarrow 0} \frac{1 - \sqrt{1-x^2}}{x} =$

(c) (5 points) $\lim_{x \rightarrow 10^-} \ln(100 - x^2) =$

(d) (5 points) $\lim_{x \rightarrow \infty} \frac{\sqrt{3x^2 - 1}}{x - 1} =$

(e) (5 points) $\lim_{x \rightarrow 4} \frac{4 - x}{|4 - x|} =$

2. (a) (8 points) Find all numbers x , with $-2\pi \leq x < 2\pi$ and $3 \cos^2 x - \sin^2 x = 0$

(b) (7 points) Find the value of $\cos \theta$ if θ is an angle in the third quadrant and $\cos 2\theta = 1/4$.

(c) (5 points) Express $\sin(\frac{3\pi}{2} - x)$ in terms of $\sin x$ and $\cos x$. Justify your answer by stating each trigonometric identity that you are using.

(d) (5 points) $\lim_{x \rightarrow 0} \frac{\tan x}{\sin x} = ?$

A list of formulas: $I = Prt$; $A = P(1 + rt)$

$$A = P(1 + i)^n; APY = (1 + \frac{r}{m})^m - 1$$

$$FV = PMT \frac{(1+i)^n - 1}{i}, \text{ where } i = \frac{r}{m} \text{ and } n = mt$$

$$PV = PMT \frac{1 - (1+i)^{-n}}{i}$$

3. You need 24,000 YTL. A friend is willing to lend you this amount, but he wants 27,000 YTL after one year. You could also borrow 24,000 YTL from Kazıkbank at 16% compounded monthly, to be paid back with monthly payments in one year.

(a) (6 points) What would be your monthly payments to Kazıkbank?

(b) (5 points) What would be the total interest you pay to Kazıkbank?

(c) (6 points) If you borrow from your friend, you could open an account at Cimribank in order to save money (para biriktirmek). How much would you have to deposit every month into an account at 8% compounded monthly to accumulate 27,000 YTL in one year?

(d) (3 points) Do you borrow 24,000 YTL from your friend or from Kazıkbank?

4. (a) (14 points) Find $(A^{-1})B$, where

$$A = \begin{bmatrix} 1 & -3 & 1 \\ -1 & 4 & 0 \\ 0 & 1 & 2 \end{bmatrix} \quad \text{and} \quad B = \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}.$$

(b) (6 points) Solve

$$\begin{cases} x_1 - 3x_2 + x_3 = -1 \\ -x_1 + 4x_2 = 1 \\ x_2 + 2x_3 = 2 \end{cases}$$

5. (10 points) The function $y = \log_b(x - a)$ has a vertical asymptote at $x = -3$, and intercepts at -2 and 2 . Find a and b .

6. (a) (12 points) Solve the following problem by the geometric approach:

$$\begin{array}{ll} \text{Maximize} & P = 10x_1 + 5x_2 \\ \text{subject to} & 4x_1 + x_2 \leq 28 \\ & 2x_1 + x_2 \geq 14 \\ & x_1 + x_2 \leq 15 \\ & x_1 \geq 0, x_2 \geq 0 \end{array}$$

(b) (8 points) Formulate the following problem as a linear programming problem (DO NOT SOLVE): A company planning an advertising campaign to attract new customers wants to place a total of at most 10 ads in 3 newspapers. Each ad in the newspaper AA costs 200 YTL and will be read by 2000 people. Each ad in the newspaper BB costs 200 YTL and will be read by 500 people. Each ad in the newspaper CC costs 100YTL and will be read by 1500 people. The newspaper CC will not accept more than 4 ads from the company. The company wants at least 16000 people to read its ads. How many ads should it place in each paper in order to minimize the advertising costs?

(c) (12 points) Solve the following problem:

$$\begin{array}{ll} \text{Maximize} & P = 5x_1 + 3x_2 - 3x_3 \\ \text{subject to} & x_1 - x_2 + 2x_3 \leq 3 \\ & 2x_1 + 2x_2 - 5x_3 \leq 10 \\ & x_1 \geq 0, x_2 \geq 0 \end{array}$$

7. (a) (12 points) Find the asymptotes (horizontal, vertical, oblique, if they exist) of the function $f(x) = \frac{2x^2 + 3x - 2}{-x + 1}$. Justify your answers.

(b) (6 points) Find a function f such that $\lim_{x \rightarrow 0} xf(x) = 0$ and $f(x)$ is not continuous at $x = 0$.