KOÇ UNIVERSITY

FALL 2017 MATH102

MIDTERM 2 December 9, 2017

Duration of the exam: 75 minutes

Instructions: Calculators are not allowed. No books, no notes, no talking allowed. Explain your answers to get full credit. You can use the back of these pages.

Name, Surname: _____

Signature: _____

Section: ☐ 1 (Mo & We 14.30-15.45) ☐ 2 (Mo & We 16.00-17.15)

Problem	**Points**	**Score**
1	30	
2	25	
3	25	
4	25	
Total	**105**	

Problem 1

a) Use implicit differentiation to find an equation of the tangent line to the curve

$$x^2 + 2xy + 4y^2 = 12$$

at the point $(2, 1)$ (10 points).

b) Find the limit

$$\lim_{x\to\infty} \left(1 + \frac{a}{x}\right)^{bx}$$

where $a, b > 0$ are fixed numbers. *(Hint:L'Hospital)* (10 points)

c) Find the absolute maximum and absolute minimum values of

$$f(x) = \ln(x^2 + x + 1)$$

on the interval $[-1, 1]$. (10 points)

Problem 2

Sketch the curve $y = \dfrac{2x^2 + x - 1}{x^2}$ using the guidelines A-H. (25 points)

A Domain

B Intercepts

C Symmetry

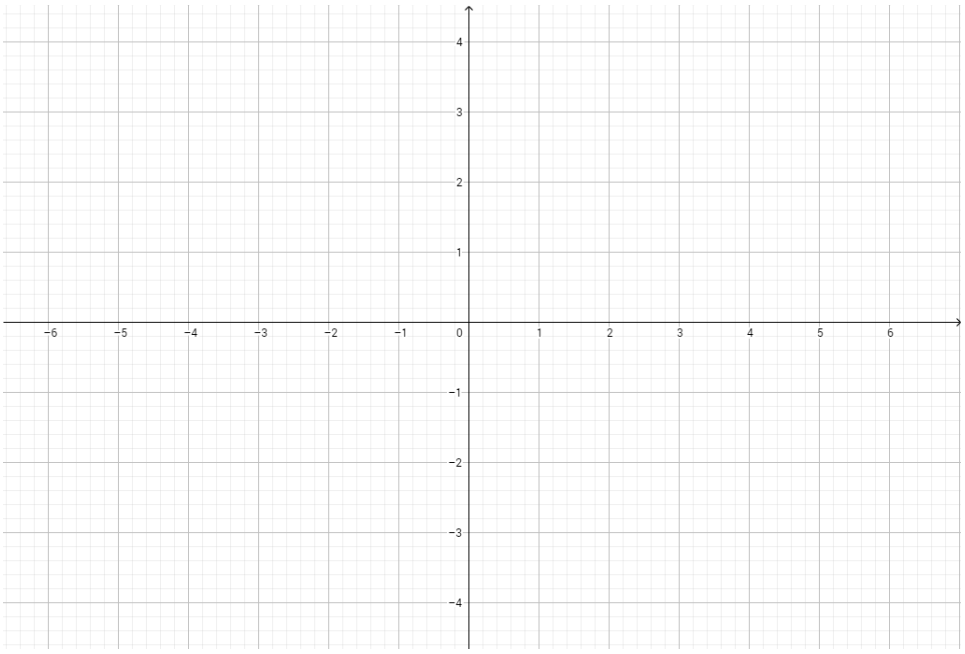
D Asymptotes

E Intervals of Increase or Decrease

F Local Max./Min.

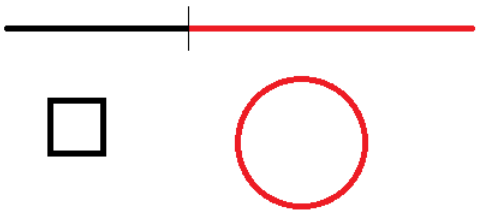
G Concavity and Points of Inflection

H Sketch



Problem 3

a) A piece of wire 10 m long is cut into two pieces. One piece is bent into a square and the other into a circle. How should the wire be cut so that the total area enclosed is **(a)** a maximum **(b)** a minimum? *(Formulas for Circle with radius r: circumference $2\pi r$, area πr^2)* (20 points)



b) Evaluate the integral (5 points)

$$\int_0^1 (3 + x\sqrt{x})\, dx$$

Problem 4

a) Evaluate the integral (5 points)

$$\int_1^3 \frac{x^3 - 2x^2 - x}{x^2}\, dx$$

b) Evaluate the indefinite integral (10 points)

$$\int \frac{\cos(\ln(x))}{x}\, dx$$

c) Evaluate the indefinite integral (10 points)

$$\int \frac{2^x}{2^x + 3}\, dx$$