



ÇANKAYA UNIVERSITY  
Department of Mathematics

**MATH 105 - Business Mathematics I**

**2018-2019 Fall**

**FIRST MIDTERM EXAMINATION  
(SAMPLE EXAM)**

**STUDENT NUMBER:**

**NAME-SURNAME:**

**SIGNATURE:**

**INSTRUCTOR:**

**DURATION:** 90 minutes

Question	Grade	Out of
1		
2		
3		
4		
5		
Total		

**IMPORTANT NOTES:**

- 1) Please make sure that you have written your student number and name above.
- 2) Check that the exam paper contains 5 problems.
- 3) Show all your work. No points will be given to correct answers without reasonable work.

1) Find the solution sets of the following expressions.

a)  $\frac{8}{x^2 - x - 6} = \frac{2}{x - 3} + \frac{1}{x + 2} \implies x = \frac{7}{3}$

b)  $(x - 2)^2 + 5x - 6 = 0 \implies x^2 + x - 2 = 0 \implies x = 1, x = -2$

c)  $\sqrt{2x + 7} = x - 4 \implies 2x + 7 = x^2 - 8x + 16 \implies x^2 - 10x + 9 = 0 \implies x = 1, x = 9$

For  $x = 1$   $\sqrt{9} = -3$  but it is not possible so only solution is  $x = 9$ .

d)  $\left| \frac{3x - 1}{2} \right| < 4 \implies -4 < \frac{3x - 1}{2} < 4 \implies \frac{-7}{3} < x < 3 \implies x \in \left( \frac{-7}{3}, 3 \right)$

2) Let  $f(x) = x^2 - 1$  and  $g(x) = \frac{1}{x + 1}$ .

a) Find  $(f \circ g)(x)$ ,  $(g \circ f)(x)$ ,  $(f - g)(x)$  and  $(fg)(x)$

b) Evaluate  $(f + 3g)(0)$  and  $(fg)(2)$ .

•  $(f \circ g)(x) = \left( \frac{1}{x + 1} \right)^2 - 1$

•  $(g \circ f)(x) = \frac{1}{x^2}$

•  $(f - g)(x) = x^2 - 1 - \frac{1}{x + 1} = \frac{x^3 + x^2 - x - 2}{x + 1}$

•  $(fg)(x) = x - 1$

•  $(f + 3g)(0) = 2$

•  $(fg)(2) = 1$

3) For the function  $f(x) = x^2 - 4x - 12$ ,

a) Find vertex, x-intercept and y-intercept points.

b) Find Domain( $f$ ) and Range( $f$ ).

c) Sketch the graph of the function.

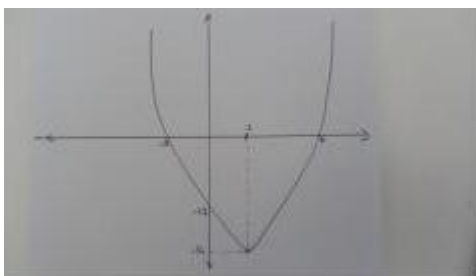
Vertex:  $(2, -16)$

y-intercept:  $(0, -12)$

x-intercepts:  $(-2, 0)$ ,  $(6, 0)$

Domain( $f$ ):  $(-\infty, \infty)$

Range( $f$ ):  $[-16, \infty)$



- 4) Find equation of a line passing through the point  $(1, -2)$  and perpendicular to the line  $2x + y + 3 = 0$ .

Slope of the line  $2x + y + 3 = 0$   $m_1 = -2$

Since lines are perpendicular  $mm_1 = -1 \implies m = 1/2$

Line equation:  $y - y_1 = m(x - x_1) \implies 2y - x + 5 = 0$

- 5) Solve the following equalities.

a)  $e^{x+1} - 1 = 2$

$$e^{x+1} = 3 \implies x + 1 = \ln 3 \implies x = \ln 3 - 1$$

b)  $\log_5 50 - \log_5 2 = \log_5 100 - x$

$$x = \log_5 100 - \log_5 50 + \log_5 2 = \log_5 \left( \frac{100 \cdot 2}{50} \right) = \log_5 4$$

c)  $\ln(x + 6) - \ln(2) = 2 \ln x$

$$\ln \left( \frac{x + 6}{2} \right) = \ln(x^2) \implies \frac{x + 6}{2} = x^2 \implies 2x^2 - x - 6 = 0 \implies$$

$x = 2, x = -3/2$  but  $\ln(-3/2)$  is undefined only solution is  $x = 2$ .