



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) $\left| \frac{5x-3}{2} \right| > 4$

$$\frac{5x-3}{2} > 4$$

$$5x-3 > 8$$

$$5x > 11$$

$$x > \frac{11}{5}$$

$$\frac{3-5x}{2} > 4$$

$$3-5x > 8$$

$$-5 > 5x$$

$$-1 > x$$

$$x \in (-\infty, -1) \cup \left(\frac{11}{5}, \infty\right)$$

b) $\frac{1}{x^2-16} = \frac{1}{x-4} + \frac{1}{x+4}$

$$(x+4)(x-4)$$

$$x \neq 4$$

$$x \neq -4$$

$$1 = x+4 + x-4$$

$$1 = 2x$$

$$x = \frac{1}{2}$$

c) $\sqrt{x^2-x-5} - 2x = 3$

$$\left(\sqrt{x^2-x-5}\right)^2 = (3+2x)^2$$

$$x^2-x-5 = 9+12x+4x^2$$

$$0 = 3x^2+13x+14$$

$$0 = (3x+7)(x+2)$$

$$x = -\frac{7}{3}$$

$$x = -2$$

} None of them satisfies the eqn.

No soln

20 pts.

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

a) Find $(f-g)(4)$

$$(f-g)(x) = \frac{1}{x-2} - \sqrt{x-1}$$

② $(f-g)(4) = \frac{1}{2} - \sqrt{3}$

b) Find $(f \circ g)(x)$

$$f(\sqrt{x-1}) = \frac{1}{\sqrt{x-1}-2}$$

③

c) Find $(g \circ f)(x)$

③ $g\left(\frac{1}{x-2}\right) = \sqrt{\frac{1}{x-2}-1}$

d) Find $\text{Dom}(g)$

④ $\begin{aligned} \sqrt{x-1} &\geq 0 \\ x-1 &\geq 0 \\ x &\geq 1 \end{aligned} \quad \text{Dom}(g) = [1, \infty)$

e) Find $\text{Dom}(f \circ g)(x)$

④ $(f \circ g)(x) = \frac{1}{\sqrt{x-1}-2}$ $\sqrt{x-1}-2 \neq 0$ and $x-1 \geq 0$
 $\sqrt{x-1} \neq 2$ $x \geq 1$
 $x-1 \neq 4$
 $x \neq 5$ $\text{Dom}(f \circ g) = [1, \infty) - \{5\}$

e) Find $\text{Dom}(g \circ f)(x)$.

④ $(g \circ f)(x) = \sqrt{\frac{1}{x-2}-1}$ $\frac{3-x}{x-2} \geq 0$ and $x \neq 2$
 $\frac{2}{-} \frac{3}{+}$ $\text{Dom}(g \circ f) = (2, 3]$

3) For the function $f(x) = 2x^2 - 6x - 20$,

- Find vertex, x-intercept and y-intercept points.
- Find $\text{Domain}(f)$ and $\text{Range}(f)$.
- Sketch the graph of the function.

a) $\left(\frac{6}{4}, f\left(\frac{3}{2}\right)\right) = \text{vertex}$
 $\left(\frac{3}{2}, -\frac{49}{2}\right)$

x-int. ; $y=0$

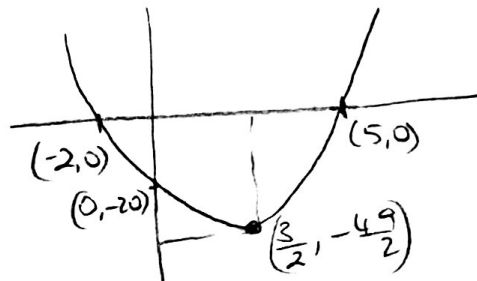
$$0 = 2x^2 - 6x - 20$$
$$0 = 2(x-5)(x+2)$$

$$x=5$$
$$x=-2$$

y-int ; $x=0$ $f(0) = -20$

b) Domain : \mathbb{R}
Range : $\left[-\frac{49}{2}, \infty\right)$

c)



15 pts

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

$$y = \frac{2x+1}{2} \quad m_1 = 1$$

Since perpendicular $m_1 \cdot m_2 = -1$ $m_2 = -1$

$$y - y_1 = m(x - x_1)$$

$$y - 2 = -1(x + 1)$$

$$y = -x + 1$$

5) Solve the following equalities.

a) $5(e^{x+1} - 1) = 2$

$$e^{x+1} - 1 = \frac{2}{5}$$

$$e^{x+1} = \frac{7}{5}$$

$$\ln e^{x+1} = \ln \frac{7}{5}$$

$$(x+1) \cancel{\ln e} = \ln \frac{7}{5}$$

$$x = \ln \frac{7}{5} - 1$$

b) $\log_2\left(\frac{x^2+x+5}{16}\right) = \log_2(4-x) - 4$

$$\log_2\left(\frac{x^2+x+5}{16}\right) - \log_2(4-x) = -4$$

$$\log_2\left(\frac{x^2+x+5}{16(4-x)}\right) = -4$$

$$\frac{x^2+x-5}{16(4-x)} = 2^{-4}$$

$$x^2+x+5 = 4-x$$

$$x^2+2x+1=0$$

$$(x+1)^2 = 0 \quad \boxed{x = -1}$$

c) $\ln(x+6) - \ln(x-2) = \ln(x+1)$

$$\ln(x+6) = \ln(x+1) + \ln(x-2)$$

$$\ln(x+6) = \ln(x+1)(x-2)$$

$$x+6 = (x+1)(x-2)$$

$$x+6 = x^2 - x - 2$$

$$0 = x^2 - 2x - 8$$

$$0 = (x-4)(x+2)$$

$\boxed{x=4}$ soln.
 $x=-2 \rightarrow$ doesn't satisfy the eqn.