

**Student Name (ARABIC):**

**Student ID:**

**Instructor Name:**

**CRN :**

**Instructions:**

This exam duration is **2 hours**.

This is NOT an open book exam.

The use of calculators is permitted.

The use of mobile phones is NOT permitted.

Please answer all the **5** questions.

The number of pages is **9 pages** including this page.

**Marking Scheme:**

Question	Score	
1 (30 Marks)		
2 (4 Marks)		
3 (6 Marks)		
4 (4 Marks)		
5 (6 Marks)		<b>Signature</b>
<b>TOTAL</b>		

**Question 1:** (30 points)

Choose the correct answer, write your answer in the table below:

**Form A**

Question	1	2	3	4	5	6	7	8	9	10
Answer	B	D	A	C	D	D	D	A	C	A
Question	11	12	13	14	15	16	17	18	19	20
Answer	C	B	B	D	B	C	A	D	C	B

**Form B**

Question	1	2	3	4	5	6	7	8	9	10
Answer	A	D	C	B	A	D	C	A	D	C
Question	11	12	13	14	15	16	17	18	19	20
Answer	D	B	D	D	C	D	C	D	A	B

**Question 2:** (4 points)

Perform and simplify the following:

1.  $(2x-3)^2 - 3x(x^2 + 5x - 2)$

**Solution:**

$$\begin{aligned}(2x-3)^2 - 3x(x^2 + 5x - 2) &= 4x^2 - 12x + 9 - 3x^3 - 15x^2 + 6x \\ &= -3x^3 - 11x^2 - 6x + 9\end{aligned}$$

2.  $\frac{x+2}{(x-1)^2} \cdot \frac{(x-3)^2}{x^2-4} \cdot \frac{3x-3}{3-x}$

**Solution:**

$$\begin{aligned}\frac{x+2}{(x-1)^2} \cdot \frac{(x-3)^2}{x^2-4} \cdot \frac{3x-3}{3-x} &= \frac{(x+2)(x-3)^2(3x-3)}{(x-1)^2(x^2-4)(3-x)} \\ &= \frac{-3(x+2)(x-3)(x-3)(x-1)}{(x-1)(x-1)(x-2)(x+2)(x-3)} \\ &= \frac{-3(x-3)}{(x-1)(x-2)}\end{aligned}$$

**Question 3:** (6 points)

Solve the following equations and inequalities:

1.  $\sqrt{x+5} = x+3$  (1)

**Solution:**

$$\begin{aligned}\sqrt{x+5} = x+3 &\Rightarrow x+5 = (x+3)^2 \\ &\Rightarrow x+5 = x^2 + 6x + 9 \\ &\Rightarrow x^2 + 5x + 4 = 0\end{aligned}$$

$\Delta = 9 \Rightarrow$  the quadratic equation has 2 real solutions:

$$x_1 = \frac{-5+3}{2} = -1 \quad \text{and} \quad x_2 = \frac{-5-3}{2} = -4$$

We check the solutions by replacing them in equation (1):

$$\sqrt{-1+5} = -1+3 \Rightarrow \sqrt{4} = 2 \quad \text{which is always true} \Rightarrow \text{this solution is then acceptable.}$$

$$\sqrt{-4+5} = -4+3 \Rightarrow \sqrt{1} = -1 \quad \text{which is impossible} \Rightarrow \text{this solution is then refused.}$$

The solution set is  $S = \{-1\}$ .

2.  $x^2 - 2x + 5 = 0$  (2)

**Solution:**

$\Delta = -16$ ;  $\Delta < 0 \Rightarrow$  the quadratic equation has 2 complex solutions:

$$\begin{aligned}x_1 &= \frac{2+i\sqrt{|\Delta|}}{2} = \frac{2+i\sqrt{16}}{2} = \frac{2+4i}{2} = 1+2i, \\ x_2 &= \frac{2-i\sqrt{|\Delta|}}{2} = \frac{2-i\sqrt{16}}{2} = \frac{2-4i}{2} = 1-2i.\end{aligned}$$

The solution set is  $S = \{(1+2i, 1-2i)\}$ .

3.

$$3|2x-1| - 5 \leq 4$$

**Solution:**

$$\begin{aligned}3|2x-1| - 5 \leq 4 &\Leftrightarrow |2x-1| \leq 3 \\ &\Leftrightarrow -3 \leq 2x-1 \leq 3 \\ &\Leftrightarrow -2 \leq 2x \leq 4 \\ &\Leftrightarrow -1 \leq x \leq 2\end{aligned}$$

The solution set is  $S = [-1, 2]$ .

**Question 4:** (4 points)

1. Given  $f(x) = 6 + 3x^2$  and  $g(x) = 2x - 1$ , find  $f(g(-3))$

**Solution:**

$$g(-3) = 2(-3) - 1 = -6 - 1 = -7$$

$$f(-7) = 6 + 3(-7)^2 = 6 + 3 \times 49 = 6 + 147 = 153$$

$$\text{Then } f[g(-3)] = 153.$$

2. Write an equation for the line shown in the graph below:

**Solution:**

The equation of the line is of the form  $y = ax + b$ .

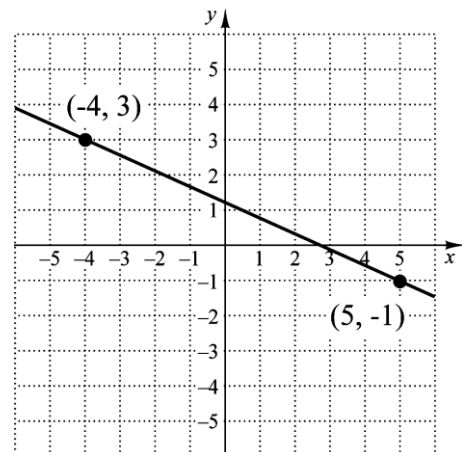
The line passes through the points  $(-4, 3)$  and  $(5, -1)$ .

One method is to solve the system

$$\begin{cases} -4a + b = 3 \\ 5a + b = -1 \end{cases}$$

Which solution is  $a = -\frac{4}{9}$  and  $b = \frac{11}{9}$ .

Then the equation of the line is  $y = -\frac{4}{9}x + \frac{11}{9}$ .



OR THE SLOPE =  $-\frac{4}{9}$

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

$$y + 1 = -\frac{4}{9}(x - 5) \quad y + 1 = -\frac{4}{9}x + \frac{20}{9} \quad y = -\frac{4}{9}x + \frac{11}{9}$$

**Question 5:** (6 points)

1. Solve the system  $\begin{cases} 2x - y = 1 \\ -x + 3y = 2 \end{cases}$  graphically.

The solution point is ( 1 , 1).

**Solution:**

The straight line representing the equation

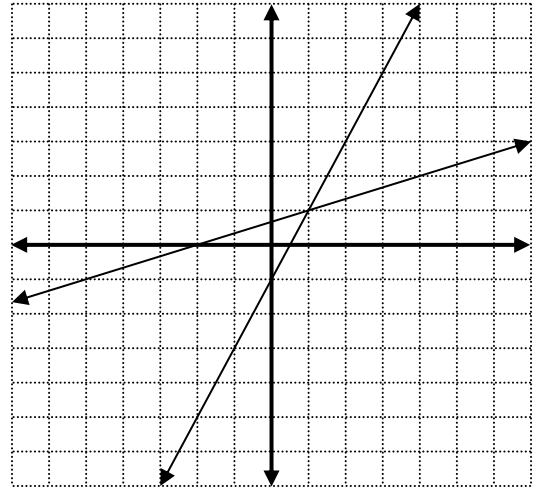
$2x - y = 1$  passes through the points (0, -1) and (2, 3).

The straight line representing the equation

$-x + 3y = 2$  passes through the points (4, 2) and (-2, 0).

From the graph we see that the two lines intersect at the point (1, 1).

The solution set is  $S = \{(1, 1)\}$ .



2. Solve the following system using the elimination method:

$$\begin{cases} 18x - 75y = 2 \\ 12x - 45y = 4 \end{cases}$$

**Solution:**

$$-2(18x - 75y = 2)$$

$$3(12x - 45y = 4)$$

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$$-36x + 150y = -4$$

$$36x - 135y = 12$$

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$$15y = 8 \quad y = \frac{8}{15}$$

$$18x - 75\left(\frac{8}{15}\right) = 2$$

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

The solution set is  $S = \left\{ \left( \frac{7}{3}, \frac{8}{15} \right) \right\}$ .