

**TEST 1 INEQUALITIES, EQUATIONS,
AND GRAPHS**

Teacher Teodoru Gugoiu

1. Verify if the given number is a solution for the given inequality.

[K/U] [3 marks]

a) $-x+1 < 2x-3, x = -1$

$-(-1)+1 < 2(-1)-3$

$2 < -5$

(false)

 $\therefore x = -1$ is not a solution

b) $x^2 - 2x < 5 - x, x = 2$

$2^2 - 2 \cdot 2 < 5 - 2$

$4 - 4 < 3$

$0 < 3$

(true)

 $\therefore x = 2$ is a solution

c) $\frac{2x-3}{2x+3} \geq 3, x = -3$

$\frac{2(-3)-3}{2(-3)+3} \geq 3$

$\frac{-9}{-3} \geq 3$

$3 \geq 3$

(true)

 $\therefore x = -3$ is a solution

2. Convert the inequality notation into the interval notation and then graph it.

[K/U] [1 mark]

$-2 \leq x < 3$

$[-2, 3)$



3. Convert the interval notation into the inequality notation and then graph it.

[K/U] [1 mark]

$(-\infty, 4]$

$x \leq 4$

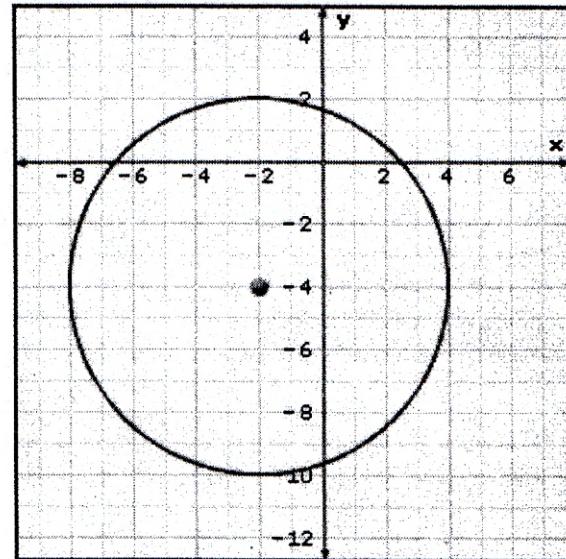


4. Write the equation of the circle represented in the right figure.

[K/U] [2 marks]

$h = -2 \therefore k = -4 \therefore R = 6$

$(x+2)^2 + (y+4)^2 = 36$



5. Solve each equality or inequality and then graph it.

[K/U] [3 marks]

a) $|x| = 5$

$x = \pm 5$

$-5 \quad 5$

$x \in \{-5, 5\}$

b) $|x| \leq 3$

$-3 \leq x \leq 3$

$-3 \quad 3$

$x \in [-3, 3]$

c) $|x| > 4$

$x < -4 \text{ or } x > 4$

$x \in (-\infty, -4) \cup (4, \infty)$



6. Solve each inequality and then graph it.

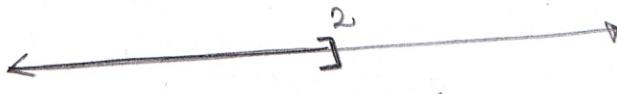
[K/U] [4 marks]

a) $6 - 2x \geq 5x - 8$

$$14 \geq 7x$$

$$x \leq 2$$

$$x \in (-\infty, 2]$$



b) $-2(3x - 1) + 2 < -2 + 3(2x - 1)$

$$-6x + 2 + 2 < -2 + 6x - 3$$

$$9 < 12x$$

$$x > \frac{3}{4}$$

$$x \in (\frac{3}{4}, \infty)$$



7. Solve each equality or inequality and then graph it.

[K/U] [4 marks]

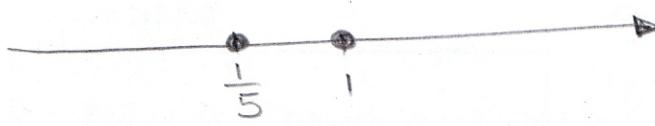
a) $|3 - 5x| = 2$

$$3 - 5x = \pm 2$$

$$3 \mp 2 = 5x$$

$$x = \frac{1}{5} \text{ or } x = 1$$

$$x \in \{\frac{1}{5}, 1\}$$



b) $|1 - 2x| \leq 3$

$$-3 \leq 1 - 2x \leq 3$$

$$\textcircled{1} \quad 1 - 3 \leq -2x$$

$$\textcircled{2} \quad 1 - 3 \leq 2x$$

$$\begin{aligned} \textcircled{1} \quad 2x \leq 4 \\ \textcircled{2} \quad x \leq 2 \end{aligned}$$

$$\begin{aligned} 1 - 3 \leq 2x \\ x \geq -1 \end{aligned}$$

$$\begin{aligned} -1 \leq x \leq 2 \\ x \in [-1, 2] \end{aligned}$$



8. Solve the inequality and then graph it. Show your work.

[A] [3 marks]

$$2x - 3 \leq 2 - 3x < -2x + 5$$

$$\textcircled{1} \quad 5x \leq 5$$

$$-3 < x$$

$$x \leq 1$$

$$-3 < x \leq 1$$

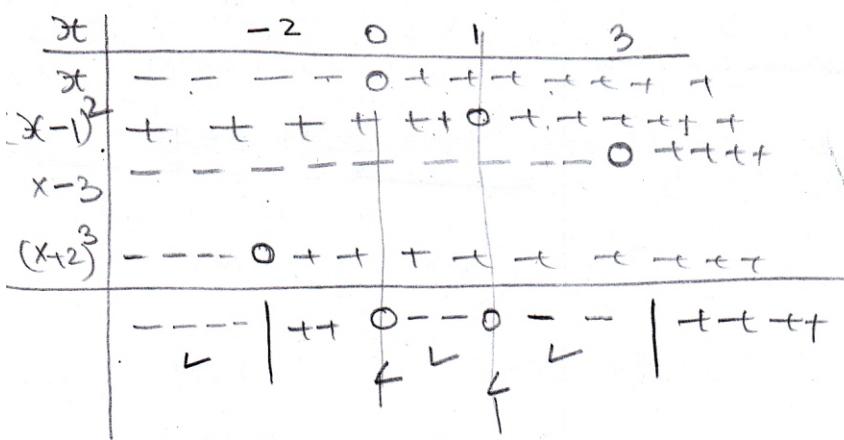
$$x \in (-3, 1]$$



9. Solve the inequality and then graph it. Show your work.

[A] [3 marks]

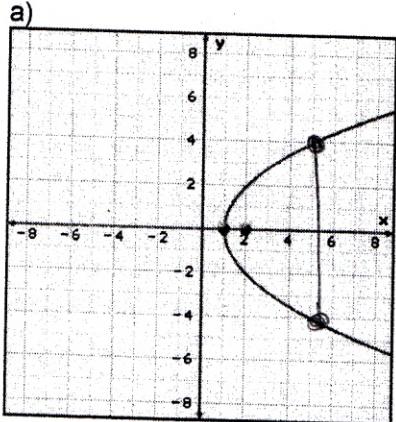
$$\frac{x(x-1)^2}{(x-3)(x+2)^3} \leq 0$$



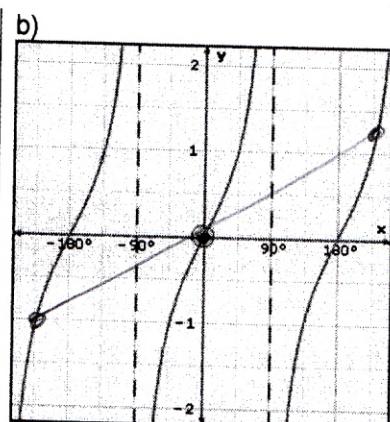
$$x \in (-\infty, -2) \cup [0, 3)$$

10. Analyse the symmetry of each graph.

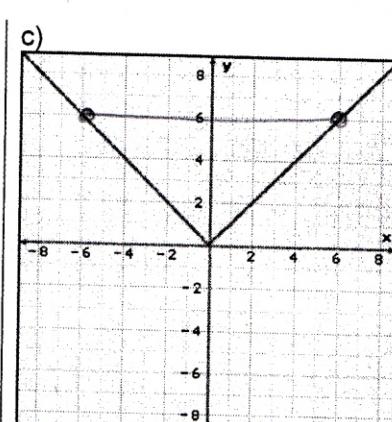
[A] [3 marks]



Graph is symmetric with respect to the x-axis.



Graph is symmetric with respect to the origin O.



Graph is symmetric with respect to the y-axis.

11. Analyse the symmetry of each equation.

[A] [3 marks]

a) $y = \frac{1}{x^2}$
 $x \rightarrow -x$ (same)

Graph is symmetric with respect to the y-axis

b) $x = y^2 - 3$
 $y \rightarrow -y$ (same)

Graph is symmetric with respect to the x-axis

c) $x^2 = |y|$

$x \rightarrow -x$, $y \rightarrow -y$ (same)
All three symmetries are here (with respect to
- x axis
- y axis
- the origin)

[A] [3 marks]

12. Graph the following circle on the grid provided on the right.

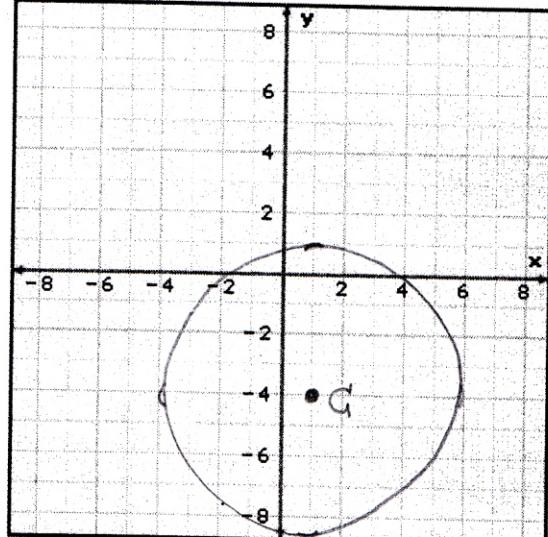
$x^2 + y^2 = 8 + 2(x - 4y)$

$x^2 - 2x + y^2 + 8y = 8$

$(x-1)^2 - 1 + (y+4)^2 - 16 = 8$

$(x-1)^2 + (y+4)^2 = 25$

C(1, -4); R=5



13. Solve the inequality and then graph it. Show your work.

[A] [3 marks]

$\frac{4x+5}{x^2} \geq \frac{4}{x+5}$

$\frac{4x+5}{x^2} - \frac{4}{x+5} \geq 0$

$\frac{4x^2 + 20x + 5x + 25 - 4x^2}{x^2(x+5)} \geq 0$

$\frac{25(x+1)}{x^2(x+5)} \geq 0$

x	-5	-1	0	
x+1	-	-	+	++
x^2	+	+	+	++
x+5	-	-	+	-
	++	--	++	++

$(-\infty, -5) \cup [-1, 0) \cup (0, \infty)$

14. Graph the following relation $x = |y|$

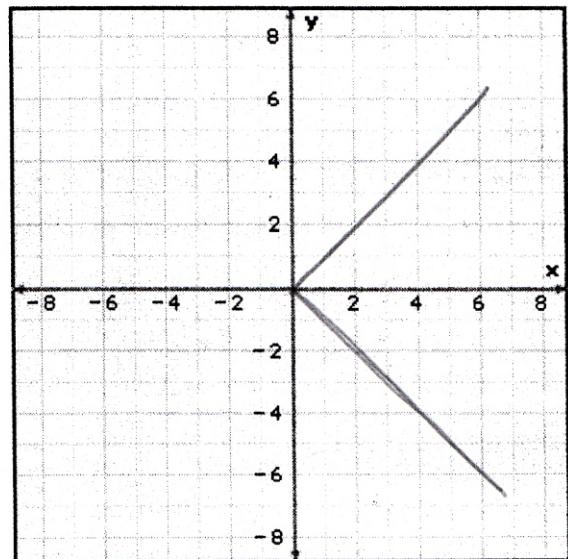
Show your work (give reasons why your answer is that.)

$$y \rightarrow -y \text{ (lawe)}$$

symmetry with respect to x -axis

$$\text{Let } y \geq 0 \Rightarrow x = y$$

[A] [3 marks]



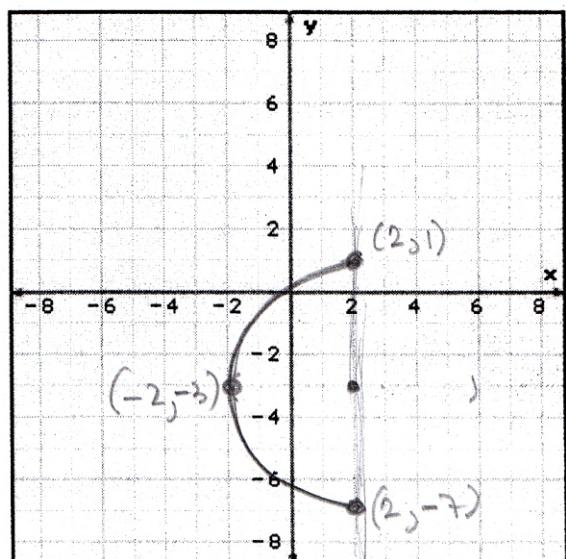
15. Graph the following semicircle $x = 2 - \sqrt{16 - (y+3)^2}$

Show your work.

$$(x-2)^2 = 16 - (y+3)^2$$

$$(x-2)^2 + (y+3)^2 = 4^2$$

[A] [3 marks]



16. Find the x-intercepts and the y-intercepts for

$$(x-1)^2 + (y+2)^2 = 16$$

Show your work, and then graph the circle.

x-int

$$y=0 \Rightarrow (x-1)^2 + 4 = 16$$

$$(x-1)^2 = 12 \Rightarrow x-1 = \pm 2\sqrt{3}$$

$$x-\text{int} = 1 \pm 2\sqrt{3}$$

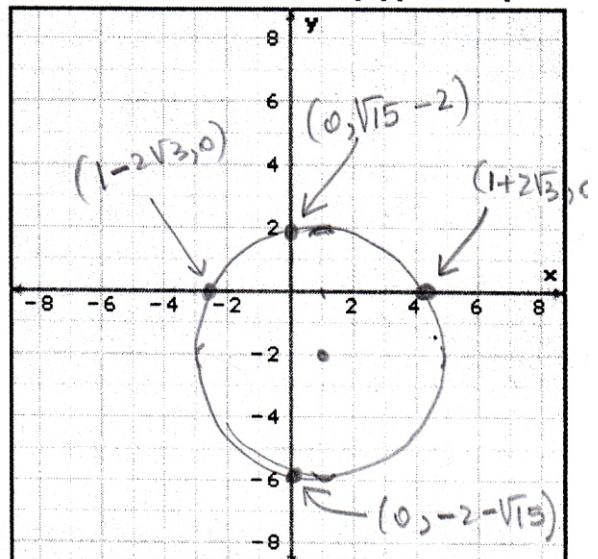
y-int

$$x=0 \Rightarrow 1 + (y+2)^2 = 16$$

$$y+2 = \pm \sqrt{15}$$

$$y-\text{int} = -2 \pm \sqrt{15}$$

[A] [4 marks]



Bonus Question. Consider the "maximum" function defined by:

$$\max(x, y) = \begin{cases} x, & \text{if } x \geq y \\ y, & \text{if } x < y \end{cases}$$

Ex: $\max(2, 3) = 3$, $\max(-3, 2) = 2$.

Graph the following relation: $\max(|x|, |y|) = 2$

$$\text{Let } x \geq 0, y \geq 0$$

$$\max(x, y) = 2$$

$$\max(x, y) = y = 2$$

$$\max(x, y) = x = 2$$

symmetry
x-axis
y-axis
origin

