

Serial #: _____ ID _____ NAME _____

Show all necessary steps for full marks.**Question 1: (5 points):** Find all points on the x -axis that are 4 units from the point $(3, -1)$.**Solution:** Points on x -axis: $(x, 0)$ The Distance between $(x, 0)$ and $(3, -1)$ is

$$\sqrt{(x-3)^2 + (0+1)^2} = 4$$

$$(x-3)^2 + 1 = 16$$

$$(x-3)^2 = 16 - 1$$

$$(x-3)^2 = 15 \Rightarrow x-3 = \pm\sqrt{15} \Rightarrow x = 3 \pm \sqrt{15} \Rightarrow x = 3 - \sqrt{15} \text{ or } x = 3 + \sqrt{15}$$

Answer: The points are: $(3 - \sqrt{15}, 0)$ and $(3 + \sqrt{15}, 0)$ **Question 2: (5 points):** If $(-2, -3)$ and (m, n) are the end points of a diameter of the circle

$$x^2 + y^2 - 4x + 6y = 3$$

, then $m + n = ?$ (Show your steps)**Solution:**

$$x^2 - 4x + 4 + y^2 + 6y + 9 = 3 + 4 + 9$$

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

$$C = (2, -3), R = 4$$

Midpoint of any diameter is $(2, -3)$

$$(2, -3) = \left(\frac{-2+m}{2}, \frac{-3+n}{2} \right)$$

$$\frac{-2+m}{2} = 2 \quad \text{and} \quad \frac{-3+n}{2} = -3$$

$$-2+m = 4 \quad \text{and} \quad -3+n = -6$$

$$\boxed{m = 6} \quad \text{and} \quad \boxed{n = -3}$$

$$m + n = 6 + (-3) = 3$$

Question 3: (5 points): Given the equation of circle $\frac{1}{2}x^2 + \frac{1}{2}y^2 - 2x + 3y = \frac{3}{2}$. Find the following

- (a): center = ?
- (b): radius = ?
- (c): Domain = ?
- (d): Range = ?
- (e): Sketch the graph

Solution:

$$\frac{1}{2}x^2 + \frac{1}{2}y^2 - 2x + 3y = \frac{3}{2}$$

$$x^2 + y^2 - 4x + 6y = 3$$

$$x^2 - 4x + 4 + y^2 + 6y + 9 = 3 + 4 + 9$$

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

$$C = (2, -3), R = 4$$

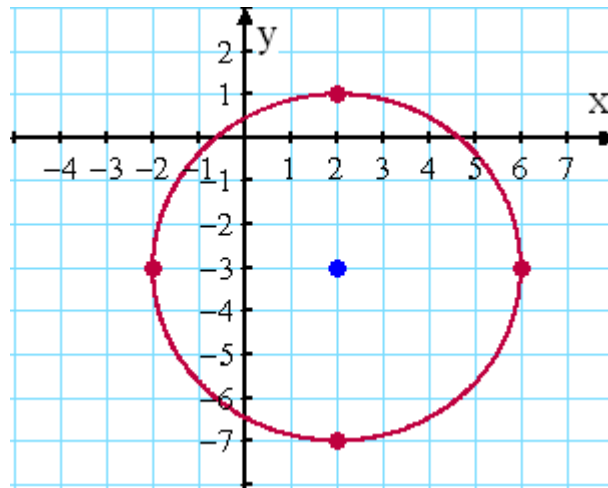
(a): center = (2, -3)

(b): radius = 4

(c): Domain = [-2, 6]

(d): Range = [-7, 1]

(e): Graph:



Question 4: (5 points): Find the x and y intercepts of the line that passes through the point (1,3) and perpendicular to the line $3x + 4y = -24$

Solution:

$$3x + 4y = -24 \Rightarrow 4y = -3x - 24 \Rightarrow m_1 = \frac{-3}{4} \Rightarrow \boxed{m_2 = \frac{4}{3}}$$

$$y - y_1 = m(x - x_1) \Rightarrow y - 3 = \frac{4}{3}(x - 1) \Rightarrow y = \frac{4}{3}x - \frac{4}{3} + 3 \Rightarrow y = \frac{4}{3}x + \frac{5}{3}$$

y-intercept is: $y = \frac{5}{3}$ or $\left(0, \frac{5}{3}\right)$

x-intercept is: $x = -\frac{5}{4}$ or $\left(-\frac{5}{4}, 0\right)$