

Section 10.4

Dr. ZABDAN

#50)

$$(x+4)^2 - 9(y-3)^2 = 9$$

$$\frac{(x+4)^2}{9} - (y-3)^2 = 1$$

Let  $X = x+4, Y = y-3$

From  $(-4, 3)$  we have:

$$\frac{X^2}{9} - Y^2 = 1$$

Hyperbola:

Center  $(0, 0)$

$$a^2 = 9 \Rightarrow a = \pm 3, (-3, 0), (3, 0)$$

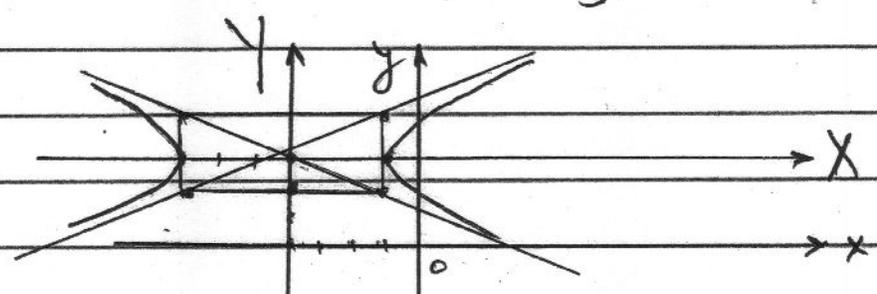
$$c^2 = a^2 + b^2 = 9 + 1 = 10$$

$$c = \pm\sqrt{10} \Rightarrow \text{Foci } (-\sqrt{10}, 0), (\sqrt{10}, 0)$$

Asymptotes:

$$\frac{X^2}{9} - Y^2 = 1$$

$$\Rightarrow Y = \pm \frac{1}{3}X$$



From the original  $xy$  system we have:

Hyperbola:

Center  $(-4, 3)$

Vertices  $(-7, 3), (-1, 3)$

$$\text{Asymptotes } (y-3) = \pm \frac{1}{3}(x+4)$$

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+ 55)

$$y^2 - 4x^2 - 4y - 8x - 4 = 0$$

$$y^2 - 4y - 4x^2 - 8x = 4$$

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

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

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

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

$$\frac{(y-2)^2}{4} - (x+1)^2 = 1 \quad ; \quad \text{let } Y = y-2, \quad X = x+1$$

From (-1, 2) we have:

$$\frac{Y^2}{4} - X^2 = 1$$

Hyperbola:

Center (0, 0)

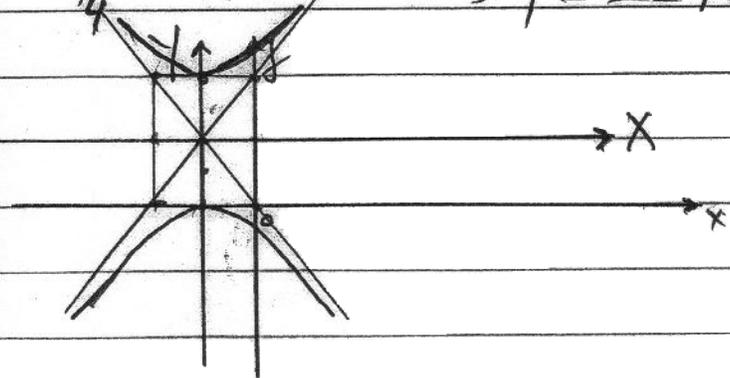
$$a^2 = 4 \Rightarrow a = \pm 2, \quad (0, -2), (0, 2)$$

$$c^2 = a^2 + b^2 = 4 + 1 = 5 \Rightarrow c = \pm \sqrt{5}$$

Foci,  $(0, -\sqrt{5}), (0, \sqrt{5})$

Asymptotes:

$$\frac{Y^2}{4} - X^2 = 0 \Rightarrow Y = \pm 2X$$



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Continue

From the original xy system we have:

Hyperbola:

Center (-1, 2)

Vertices (-1, 0), (-1, 4)

Foci (-1, 2 - sqrt(5)), (-1, 2 + sqrt(5))

Asymptotes: (y-2) = +/- 2(x+1)

#60)

x^2 - 3y^2 + 8x - 6y + 4 = 0

x^2 + 8x - 3y^2 - 6y = -4

x^2 + 8x + 16 - 16 - 3(y^2 + 2y) = -4

(x+4)^2 - 3(y^2 + 2y + 1 - 1) = -4 + 16

(x+4)^2 - 3(y+1)^2 + 3 = 12

(x+4)^2 - 3(y+1)^2 = 9

(x+4)^2/9 - (y+1)^2/3 = 1

let X = x+4, Y = y+1

From (-4, -1) we have:

X^2/9 - Y^2/3 = 1

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Question # 60

$$\frac{x^2}{9} - \frac{y^2}{3} = 1$$

Hyperbola: Center (0,0)

$$a^2 = 9 \Rightarrow a = \pm 3, (-3, 0), (3, 0)$$

$$c^2 = a^2 + b^2 = 9 + 3 = 12$$

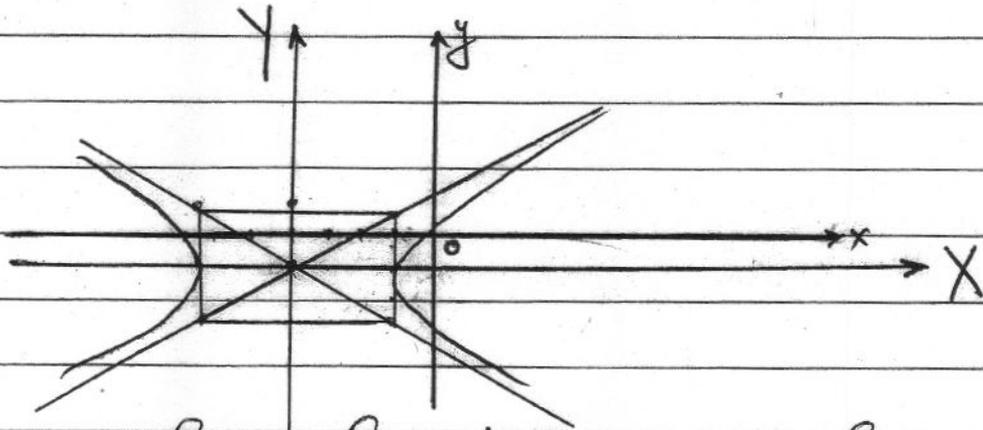
$$c = \pm\sqrt{12} = \pm 2\sqrt{3}, (-2\sqrt{3}, 0), (2\sqrt{3}, 0)$$

Asymptotes:

$$\frac{x^2}{9} - \frac{y^2}{3} = 0$$

$$y^2 = \frac{2}{9}x^2 \Rightarrow y = \pm \frac{\sqrt{2}}{3}x$$

$$y = \pm \frac{\sqrt{3}}{3}x$$



From the original coordinate system we have:

Hyperbola:

Center (-4, -1)

Vertices (-7, -1), (-1, -1)

Foci  $(-2\sqrt{3}-4, -1), (2\sqrt{3}-4, -1)$

Asymptotes  $(y+1) = \pm \frac{\sqrt{3}}{2}(x+4)$