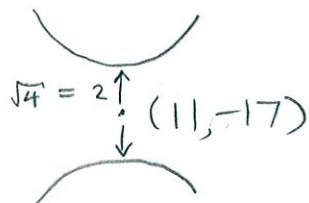


Find the co-ordinates of the vertices and foci, and the equations of the asymptotes of the hyperbola

SCORE: ____ / 5 PTS

$$\frac{(y+17)^2}{4} - \frac{(x-11)^2}{36} = 1. \text{ State clearly which co-ordinates are for which points.}$$



$$c^2 = 4 + 36$$

$$c^2 = 40$$

$$c = 2\sqrt{10}$$

$$\text{CENTER} = (11, -17)$$

$$\text{VERTICES} = (11, -17 \pm 2) = \underline{(11, -15)}, \underline{(11, -19)}$$

$$\text{FOCI} = \underline{(11, -17 \pm 2\sqrt{10})}$$

$$\text{ASYMPTOTES: } m = \pm \frac{\sqrt{4}}{\sqrt{36}} = \pm \frac{2}{6} = \pm \frac{1}{3}$$

$$\underline{y + 17 = \pm \frac{1}{3}(x - 11)}$$

Find the equations of the following conics.

SCORE: ____ / 9 PTS

- [a] hyperbola with vertices $(-10, 11)$ and $(2, 11)$, and foci $(4, 11)$ and $(-12, 11)$

$$\text{CENTER} = \left(\frac{-10+2}{2}, 11 \right) = (-4, 11)$$

$$\frac{(x+4)^2}{36} - \frac{(y-11)^2}{28} = 1$$



$$8^2 = 6^2 + b^2$$

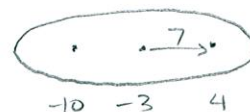
$$b^2 = 64 - 36 = 28$$

+ (1) FOR CORRECT ORDER OF SUBTRACTION ($x^2 - y^2$)

- [b] ellipse with foci $(-10, 12)$ and $(4, 12)$, and major axis of length 16

$$\text{CENTER} = \left(\frac{-10+4}{2}, 12 \right) = (-3, 12)$$

$$\frac{(x+3)^2}{64} + \frac{(y-12)^2}{15} = 1$$



$$2a = 16 \rightarrow a = 8$$

$$7^2 = 8^2 - b^2$$

$$b^2 = 64 - 49 = 15$$

Using the distance-based definition of a hyperbola, find the equation of the hyperbola with foci $(0, \pm 10)$

SCORE: ____ / 9 PTS

such that the distances from any point on the hyperbola to the foci differ by 10. Show the algebraic work, not just the final answer.

IF (x, y) IS ON THE HYPERBOLA,

$$\text{DISTANCE FROM } (x, y) \text{ TO } (0, -10) - \text{DISTANCE FROM } (x, y) \text{ TO } (0, 10) = \pm 10$$

$$\sqrt{x^2 + (y+10)^2} - \sqrt{x^2 + (y-10)^2} = \pm 10 \quad (2)$$

$$\sqrt{x^2 + (y+10)^2} = \pm 10 + \sqrt{x^2 + (y-10)^2} \quad (1)$$

$$\left[\begin{aligned} x^2 + y^2 + 20y + 100 &= 100 \pm 20\sqrt{x^2 + y^2 - 20y + 100} \\ &\quad + x^2 + y^2 - 20y + 100 \end{aligned} \right] \quad (2)$$

$$40y - 100 = \pm 20\sqrt{x^2 + y^2 - 20y + 100}$$

$$2y - 5 = \pm \sqrt{x^2 + y^2 - 20y + 100} \quad (1)$$

$$4y^2 - 20y + 25 = x^2 + y^2 - 20y + 100 \quad (1)$$

$$3y^2 - x^2 = 75 \quad (1)$$

$$\frac{y^2}{25} - \frac{x^2}{75} = 1 \quad (1)$$

Find the co-ordinates of the foci, vertices, and endpoints of the minor axis of the ellipse

SCORE: ____ / 7 PTS

$4x^2 + y^2 + 32x + 6y + 57 = 0$. State clearly which co-ordinates are for which points.

$$4x^2 + 32x + y^2 + 6y = -57$$

$$(1) \quad 4(x^2 + 8x + 16) + (y^2 + 6y + 9) = -57 + 4 \cdot 16 + 9 \quad (1/2)$$

$$4(x+4)^2 + (y+3)^2 = 16 \quad (1)$$

$$\frac{(x+4)^2}{4} + \frac{(y+3)^2}{16} = 1 \quad (1/2) \quad \left(\begin{array}{c} \vdots \\ \vdots \end{array} \right)$$

$$c^2 = 16 - 4 = 12$$

$$c = 2\sqrt{3}$$

$$\text{CENTER} = (-4, -3)$$

$$\text{VERTICES} = (-4, -3 \pm 4) = (-4, 1), (-4, -7) \quad (1/2)$$

$$\text{FOCI} = (-4, -3 \pm 2\sqrt{3}) \quad (1/2)$$

$$\text{ENDPOINTS OF MINOR AXIS} = (-4 \pm 2, -3) = (-2, -3), (-6, -3)$$

(1)