

King Fahd University of Petroleum and Minerals

Prep-Year Math Program

Math 002 - Term 132

Recitation (10.2 and 10.3)

Question 1: Find the center, vertices, foci, and eccentricity of the ellipse given by the equation: $4(x - 1)^2 + 16y^2 = 4$

Answer:

$$\text{center} = (1, 0)$$

$$\text{Foci} = (h \pm c, k) = \left(1 \pm \frac{\sqrt{3}}{2}, 0\right) = \left(\frac{2 \pm \sqrt{3}}{2}, 0\right)$$

$$\text{vertices} = (h \pm a, k) = (1 \pm 1, 0) = (0, 0), (2, 0)$$

$$e = \text{eccentricity} = \frac{c}{a} = \frac{\sqrt{3}}{2}$$

Question 2

a) Find the equation in the standard form of the ellipse that has vertices at (5, 6) and (5, -4) and foci at (5, 4) and (5, -2).

b) Find the equation in the standard form of the ellipse with foci at (-1, 2) and (3, 2) that passes through the point (3, 5).

Answer:

(a):
$$\boxed{\frac{(x - 5)^2}{16} + \frac{(y - 1)^2}{25} = 1}$$

(b):
$$\boxed{\frac{(x - 1)^2}{16} + \frac{(y - 2)^2}{12} = 1}$$

Question 3 Find the center, vertices, foci, eccentricity, and asymptotes of the hyperbola given by the equation $x^2 - x - y^2 - 2y = 0$.

Answer:
$$\text{Vertices} = \left(\frac{1}{2}, -1 \pm \frac{\sqrt{3}}{2}\right) \quad \text{Foci} = \left(\frac{1}{2}, -1 \pm \frac{\sqrt{6}}{2}\right) \quad \text{center} = \left(\frac{1}{2}, -1\right)$$

$$\text{eccentricity} = \sqrt{2}$$

Asymptotes are
$$y = x - \frac{3}{2}, \quad y = -x - \frac{1}{2}$$

Question 4

- a) Find the equation in the standard form of the hyperbola with vertices (2, 3) and (-2, 3) , and eccentricity $\frac{5}{2}$.
- b) Find the equation in the standard form of the hyperbola with foci (0,5) and (0,-5), and asymptotes $y = \pm 2x$.

Answer:

(a): $\boxed{\frac{x^2}{4} - \frac{(y-3)^2}{21} = 1}$

(b): $\boxed{\frac{y^2}{20} - \frac{x^2}{5} = 1}$

Question5

The equation of one of the asymptotes of the hyperbola $4(x-1)^2 - (y+1)^2 - 16 = 0$

A) $y = 2x + 7$

B) $y = 2x - 3$

C) $y = 2x - 8$

D) $y = x - 4$

E) $y = 2x + 6$

Answer: $y = 2x - 3$ or $y = -2x + 1$