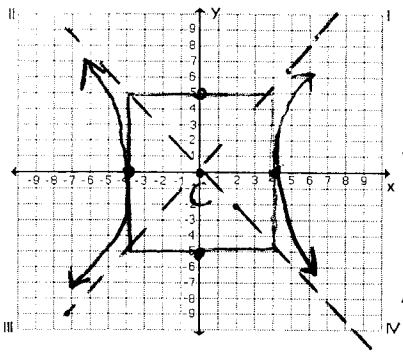
Pre-Calculus
Homework Worksheet

Hyperbolas

Graph the hyperbola and identify the center, vertices, foci, and asymptotes.

1. $\frac{x^2}{16} - \frac{y^2}{25} = 1$

$c^2 = 16+25$
$c = \sqrt{41}$



Center: (0,0)

Vert: (4,0) & (-4,0)

Foci: $(\sqrt{41},0)$ $(-\sqrt{41},0)$

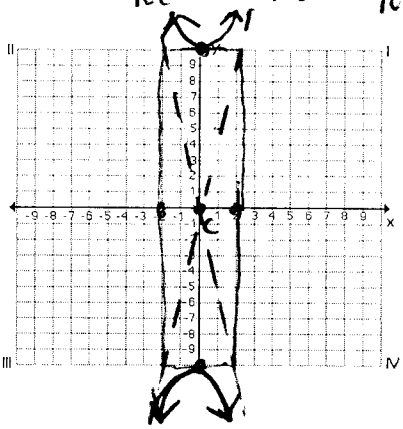
Asym: $y = 0 \pm \frac{5}{4}(x-0)$

$y = \pm\frac{5}{4}x$

2. $\frac{y^2 - 25x^2}{100} = \frac{100}{100}$

$\frac{y^2}{100} - \frac{x^2}{4} = 1$

$c^2 = 100+4$
$c = \sqrt{104}$
$c = 2\sqrt{26}$



Center: (0,0)

Vert: (0,10) & (0,-10)

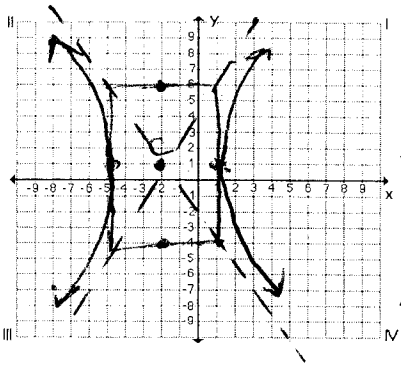
Foci: $(0, 2\sqrt{26})$ $(0, -2\sqrt{26})$

Asym: $y = 0 \pm \frac{10}{2}(x-0)$

$y = \pm 5x$

3. $\frac{(x+2)^2}{9} - \frac{(y-1)^2}{25} = 1$

$c^2 = 9+25$
$c = \sqrt{34}$



Center: (-2,1)

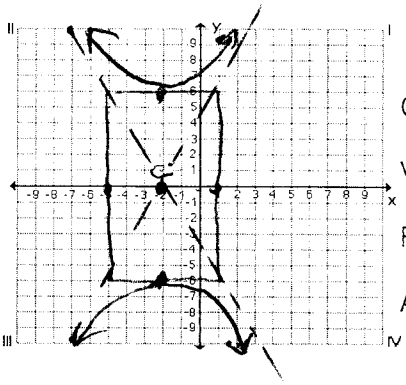
Vert: (1,1) & (-5,1)

Foci: $(-2+\sqrt{34}, 1)$
$(-2-\sqrt{34}, 1)$

Asym: $y = 1 \pm \frac{5}{3}(x+2)$

4. $\frac{y^2}{36} - \frac{(x+2)^2}{9} = 1$

$c^2 = 36+9$
$c = \sqrt{45}$
$c = 3\sqrt{5}$



Center: (-2,0)

Vert: (-2,6) & (-2,-6)

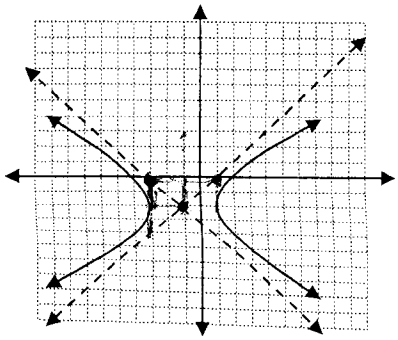
Foci: $(-2, 3\sqrt{5})$ $(-2, -3\sqrt{5})$

Asym: $y = 0 \pm \frac{6}{3}(x+2)$

$y = \pm 2(x+2)$

Find the standard form of the equation of each hyperbolas.

5.

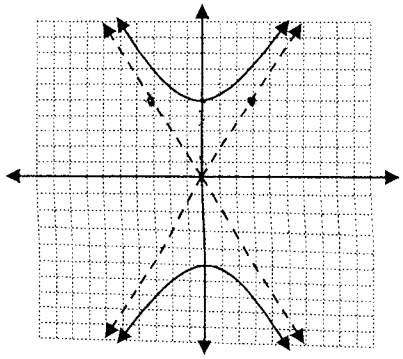


C(-1,-2)

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

$m = \pm\frac{2}{2}$

6.



C(0,0)

$\frac{y^2}{25} - \frac{x^2}{9} = 1$

$m = \pm\frac{5}{3}$

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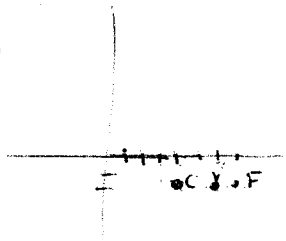
Find the standard form of the equation of each hyperbola satisfying the given conditions.

7. Center: (4, -2); Focus: (7, -2); Vertex: (6, -2)

$$\frac{(x-4)^2}{4} - \frac{(y+2)^2}{5} = 1$$

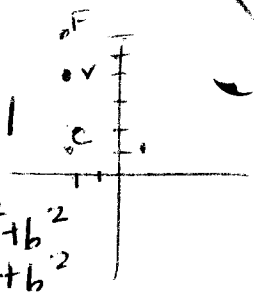


$c^2 = a^2 + b^2$

$9 = 4 + b^2 \quad b^2 = 5$

8. Center: (-2, 1); Focus: (-2, 6); Vertex: (-2, 4)

$$\frac{(y-1)^2}{9} - \frac{(x+2)^2}{16} = 1$$



$c^2 = a^2 + b^2$

$25 = 9 + b^2$

$16 = b^2$

Convert each equation to standard form by completing the square.

9. $x^2 - y^2 - 2x - 4y - 4 = 0$

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

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

10. $16x^2 - y^2 + 64x - 2y + 67 = 0$

$16(x^2 + 4x + 4) - (y^2 + 2y + 1) = -67 + 64 - 1$

$$\frac{16(x+2)^2 - (y+1)^2}{-4} = \frac{-4}{-4}$$

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

11. $4x^2 - 9y^2 - 16x + 54y - 101 = 0$

$4(x^2 - 4x + 4) - 9(y^2 - 6y + 9) = 101 + 16 - 81$

$$\frac{4(x-2)^2 - 9(y-3)^2}{36} = \frac{36}{36}$$

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

12. $4x^2 - 25y^2 - 32x + 164 = 0$

$4(x^2 - 8x + 16) - 25(y^2) = -164 + 64$

$$\frac{4(x-4)^2 - 25y^2}{100} = \frac{-100}{-100}$$

$$\boxed{\frac{y^2}{4} - \frac{(x-4)^2}{25} = 1}$$

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