Hyperbola - Writing Equations Notes

Hyperbolas – Writing Equations

Example 5:

Write the equation of the hyperbola in standard form.

1) rearrange/group
2) factor coeff.
3) complete square
4) factor/combine
5) divide: eqn = 1

$$9x^2 - y^2 + 36x + 2y + 26 = 0$$

$$\left(9x^2 + 36x\right) + \left(-y^2 + 2y\right) = -26$$

$$9\left(x^2 + 4x + 4\right) - \left(y^2 - 2y + 1\right) = -26 + 36 - 1$$

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

☆ be careful with negatives!

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

Example 6:

Write the equation of the hyperbola in standard form.

$$3x^2 - 2y^2 - 24x - 8y + 34 = 0$$

$$\left(3x^2 - 24x\right) + \left(-2y^2 - 8y\right) = -34$$

$$3\left(x^2 - 8x + 16\right) - 2\left(y^2 + 4y + 4\right) = -34 + 48 - 8$$

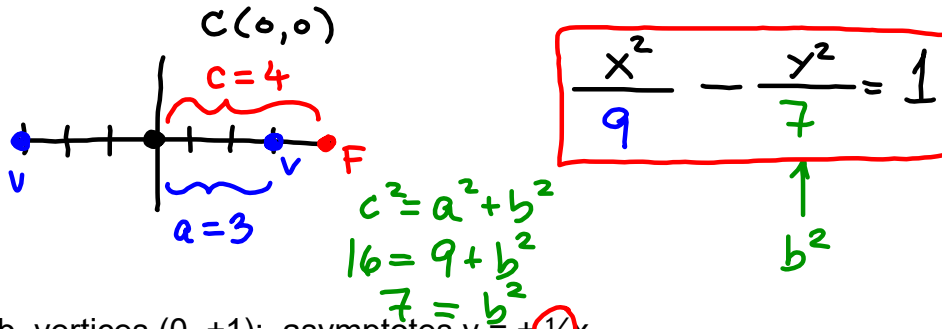$$\frac{3(x-4)^2}{6} - \frac{2(y+2)^2}{6} = \frac{6}{6}$$

$$\frac{(x-4)^2}{2} - \frac{(y+2)^2}{3} = 1$$
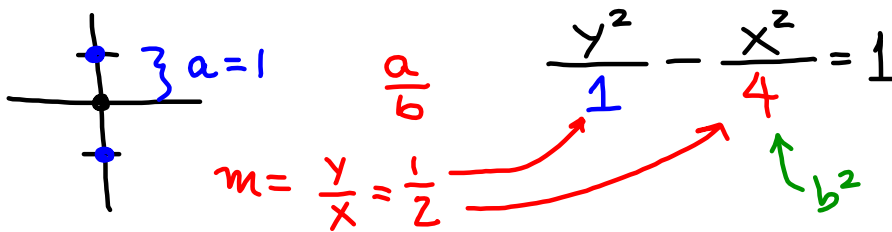
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Hyperbola - Writing Equations Notes

Example 7:

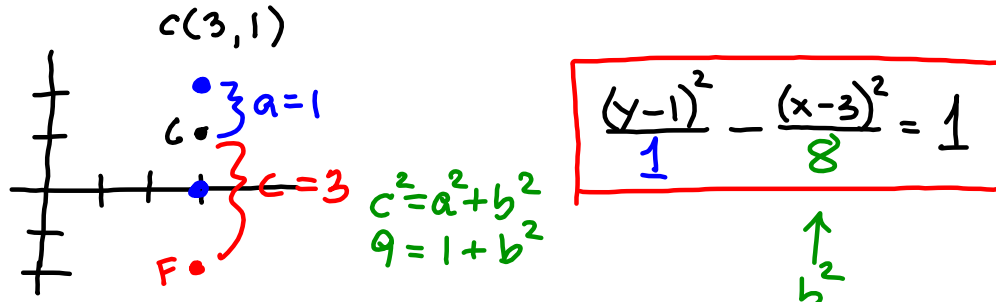Write the standard form of the equation of the specified hyperbola.

a. vertices (±3, 0); foci (±4, 0)

$C(0,0)$

$c = 4$

V V F

$a = 3$

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

$16 = 9 + b^2$

$7 = b^2$

$$\frac{x^2}{9} - \frac{y^2}{7} = 1$$

b^2

b. vertices (0, ±1); asymptotes y = ±½x

$C(0,0)$

$a = 1$

$\frac{a}{b}$

$m = \frac{y}{x} = \frac{1}{2}$

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

b^2

c. vertices (3, 0) and (3, 2); foci (3, −2) and (3, 4)

$C(3,1)$

$a = 1$

$c = 3$

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

$9 = 1 + b^2$

F

$$\frac{(y-1)^2}{1} - \frac{(x-3)^2}{8} = 1$$

b^2

d. vertices (0, 3) and (4, 3); asymptotes y − 3 = ±1(x − 2)

$C(2,3)$

$a = 2$

$m = \frac{y}{x} = \frac{1}{1} = \frac{2}{2}$

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

b^2

2