General Conic Form: $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$

Standard Forms

Parabola: $x = a(y-k)^2 + h$ $\quad$ $y = a(x-h)^2 + k$

$a>0$ $a<0$ $\quad$ $a>0$ $a<0$

Hyperbola: $\dfrac{(x-h)^2}{a^2} - \dfrac{(y-k)^2}{b^2} = 1$ $\quad$ $\dfrac{(y-k)^2}{a^2} - \dfrac{(x-h)^2}{b^2} = 1$

Ellipse: $\dfrac{(x-h)^2}{a^2} + \dfrac{(y-k)^2}{b^2} = 1$ $\quad a^2 > b^2$ $\quad$ $\dfrac{(x-h)^2}{b^2} + \dfrac{(y-k)^2}{a^2} = 1$

Circle: $(x-h)^2 + (y-k)^2 = r^2$

Example 1: Classify and graph. Label EVERYTHING!

$y^2 - 8y + 4x + 24 = 0$ $\quad$ parabola $\quad x = a(y-k)^2 + h$

$y^2 - 8y + 16 = -4x - 24$

$+16$

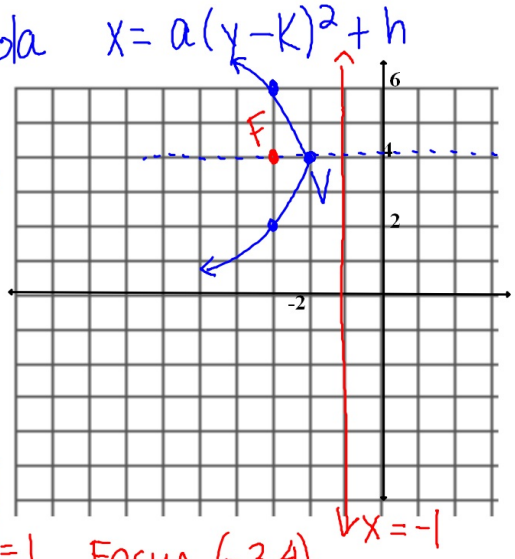
$(y-4)^2 = -4x - 8$

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

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

$V(-2, 4)$

$c = \left|\frac{1}{4(-\frac{1}{4})}\right| = 1$ $\quad$ Focus $(-3, 4)$



Example 2: Classify and graph. Label EVERYTHING!

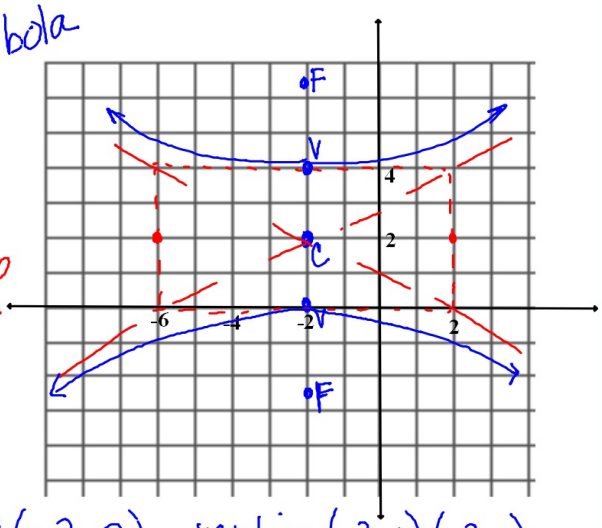
$4y^2 - x^2 - 16y - 4x - 4 = 0$ hyperbola

$4y^2 - 16y \quad -x^2 - 4x \quad = 4$

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

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

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



C(-2, 2) vertices (-2, 0) (-2, 4)

$c^2 = a^2 + b^2 = 20 \quad c = \pm\sqrt{20}$

$c \sim \pm 4.5$