

Example #b p. 10 Ch. 11

Given a random equation can you tell if it is a hyperbola, ellipse, parabola or degenerate.

$$4x^2 - 4x - 8y + 9 = 0$$

- Notice x^2 and y 's aren't so 1st move the y 's & constant to the right

$$4x^2 - 4x = 8y - 9$$

Complete the Square for x's

Step 1: Remove the numeric coefficient

$$4(x^2 - x) = 8y - 9$$

Step 2: Complete the square

$$\left(\frac{1}{2} \cdot 1\right)^2 = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$$

$$4\left(x^2 - x + \frac{1}{4}\right) = 8y - 9 + 1$$

Remember that $4 \cdot \frac{1}{4} = 1$ is actually what was added in on the left

Step 3: Rewrite

$$4\left(x - \frac{1}{2}\right)^2 = 8y - 8$$

Remove the x^2 's numeric coefficient

- Divide all terms by 4.

$$\frac{4(x - 1/2)^2}{4} = \frac{8y}{4} - \frac{8}{4}$$

So, $1(x - 1/2)^2 = 2y - 2$

- Factor the y 's $(x - 1/2)^2 = 2(y - 2)$
- This is a shifted **parabola**, since only the x 's are squared and y is 1st degree.