9-5 GRAPHS OF EXPENSE AND REVENUE FUNCTIONS

OBJECTIVES

Write, graph and interpret the expense function.

Write, graph and interpret the revenue function.

Identify the points of intersection of the expense and revenue functions.

Identify breakeven points, and explain them in the context of the problem.

Factor a quadratic using the method of completing the square.

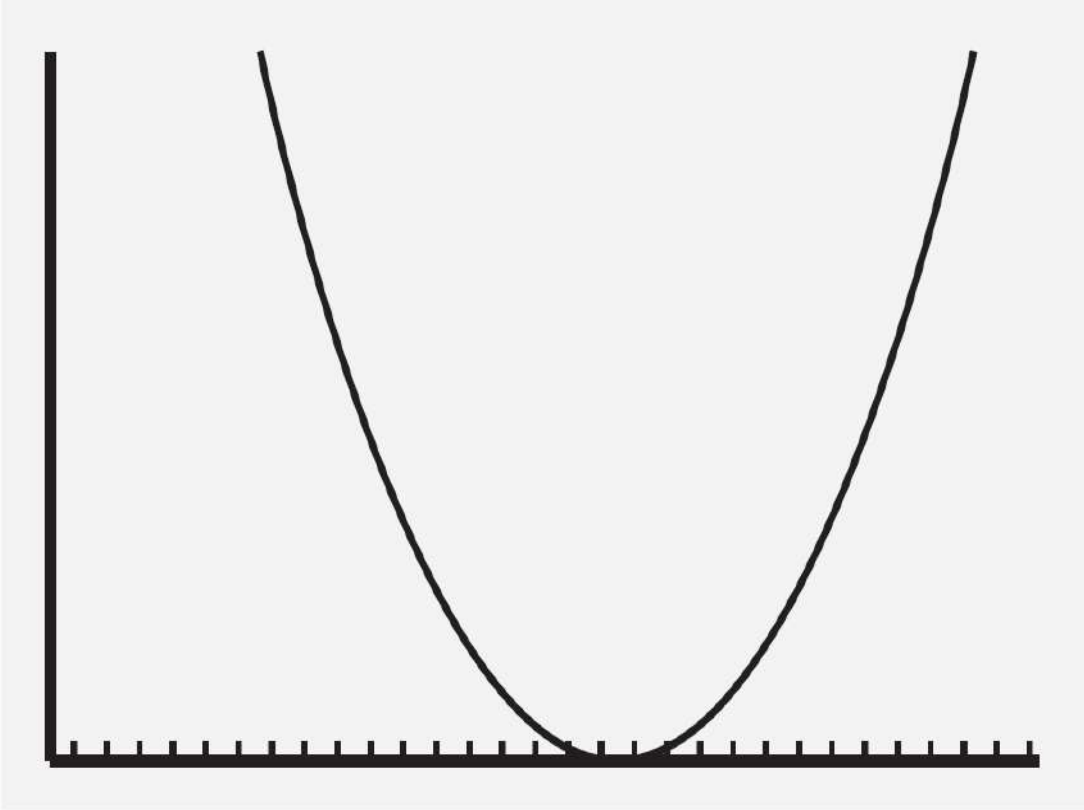
Key Terms

- nonlinear function
- second-degree equation
- quadratic equation
- parabola
- leading coefficient
- minimum
- vertex
- maximum
- axis of symmetry
- roots
- zeros
- quadratic formula
- perfect square trinomial
- completing the square

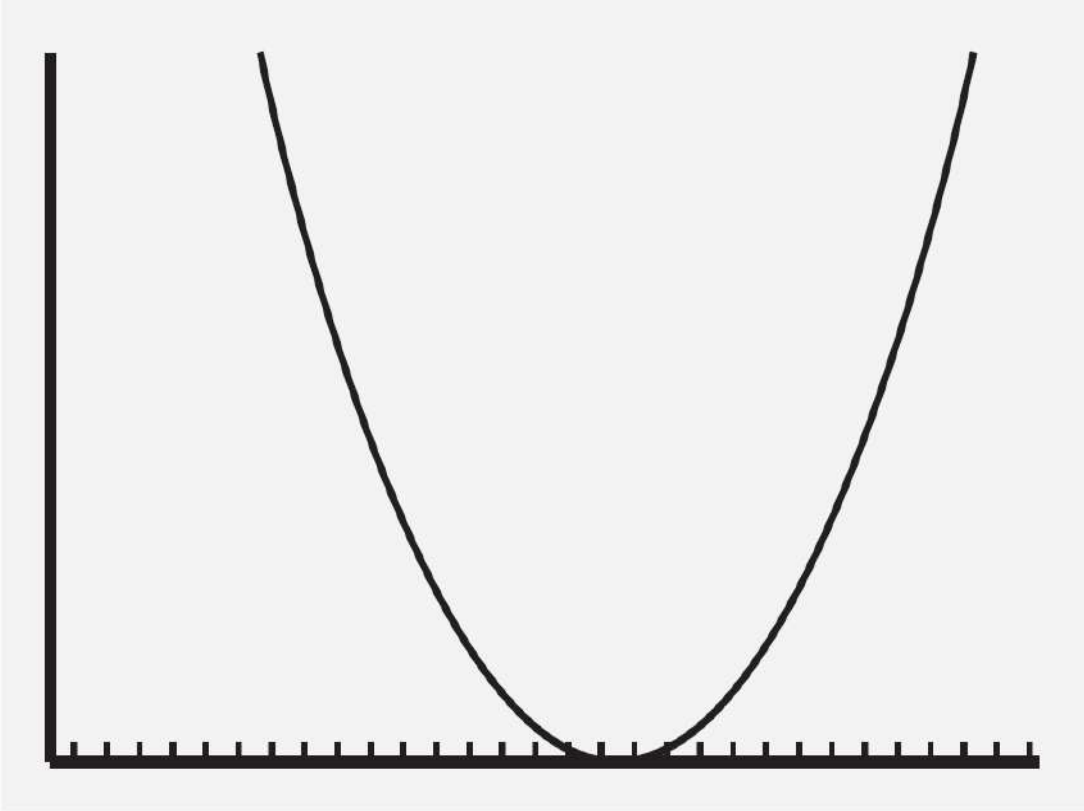
How can expense and revenue be graphed?

- How does price contribute to consumer demand?
- Name some other factors that might also play a role in the quantity of a product consumers purchase.
- Why does a non-vertical line have slope but a nonlinear function does not?

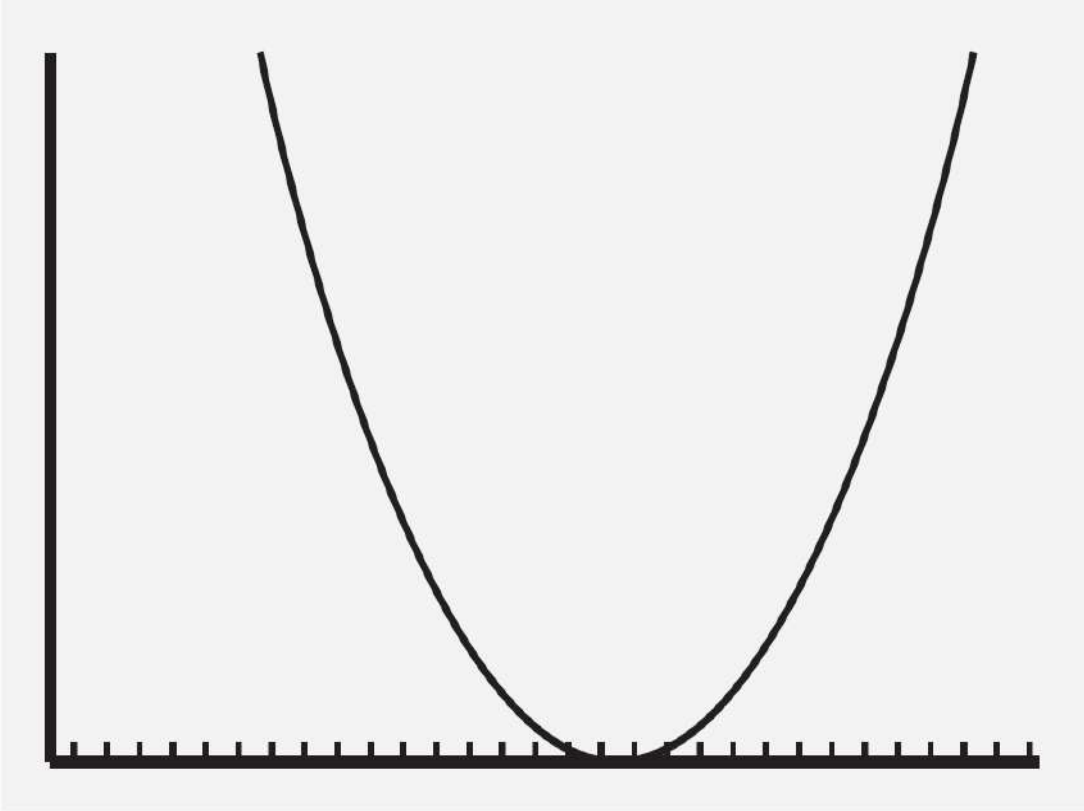
Parabola:



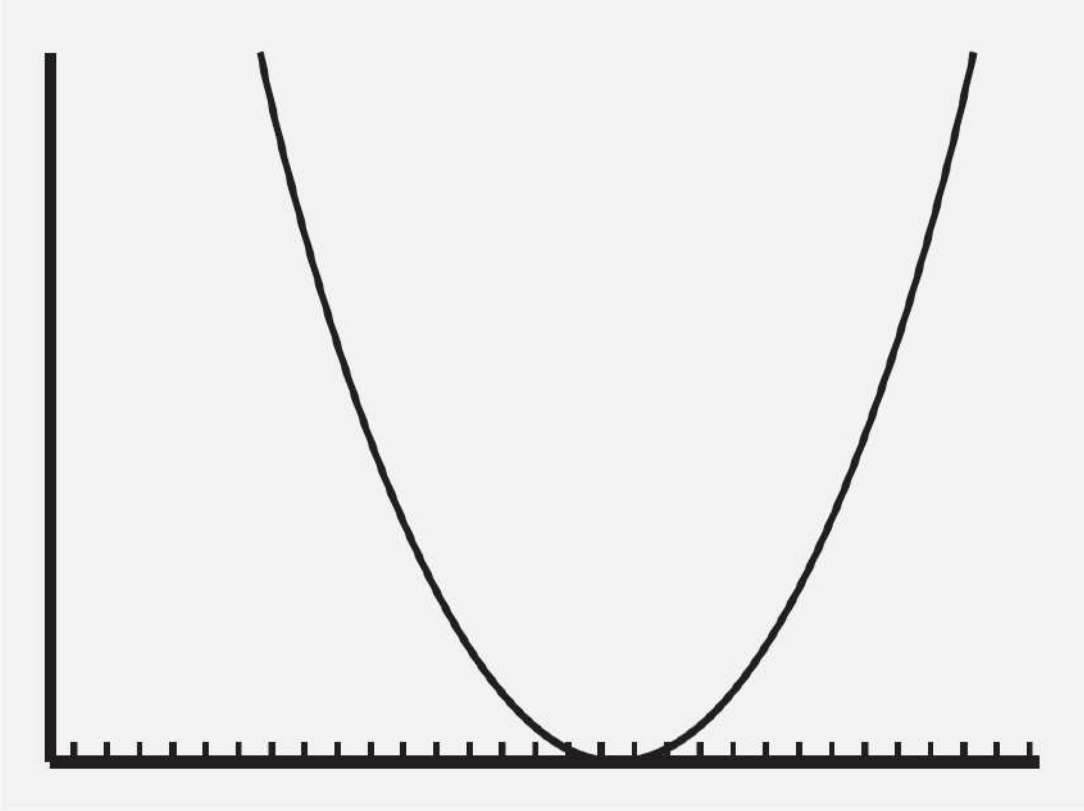
Parabola: quadradic equation



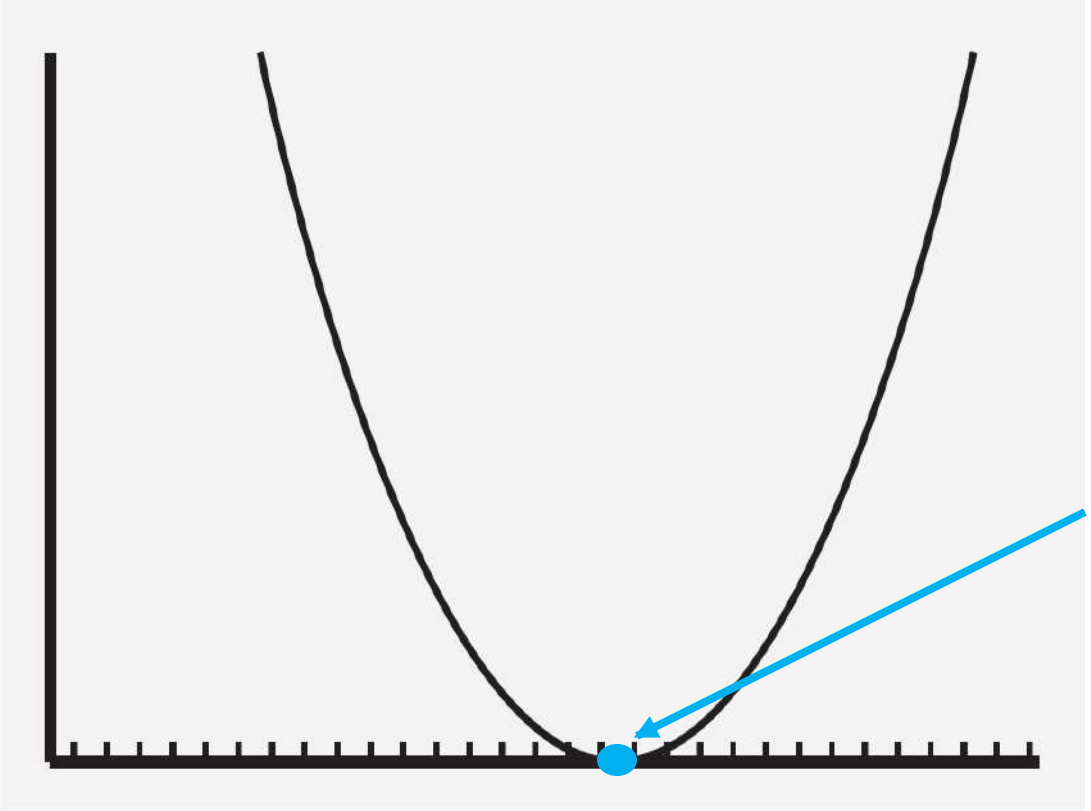
Parabola: quadradic equation; $y=ax^2+bx+c$



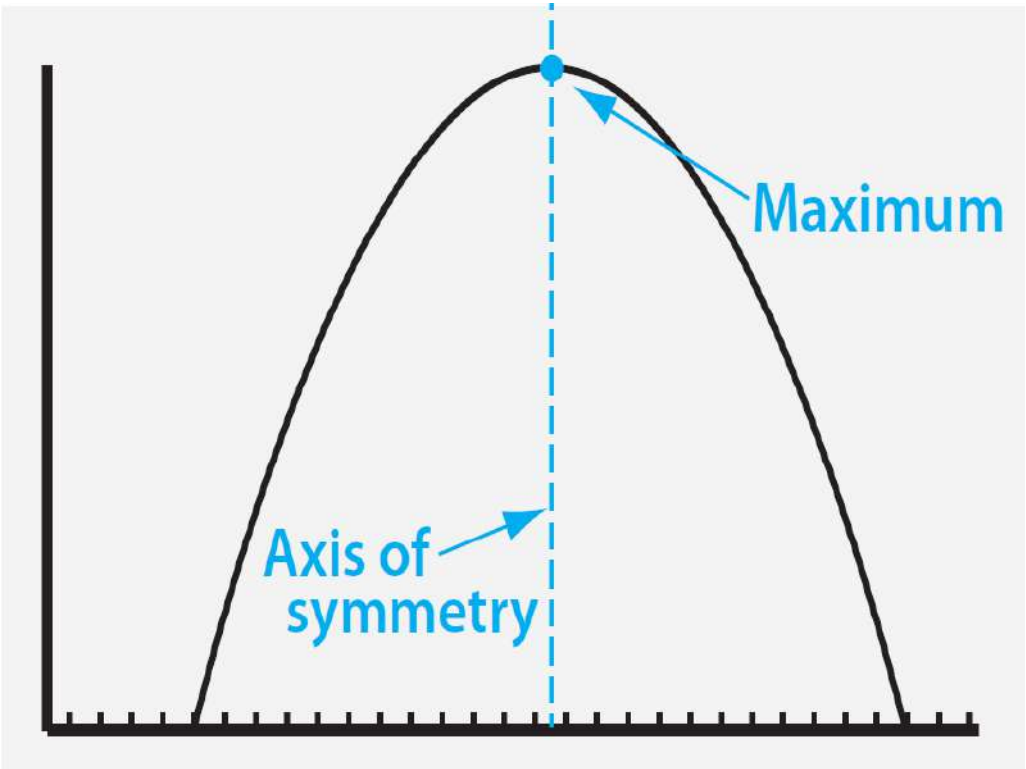
Parabola with a positive leading coefficient:



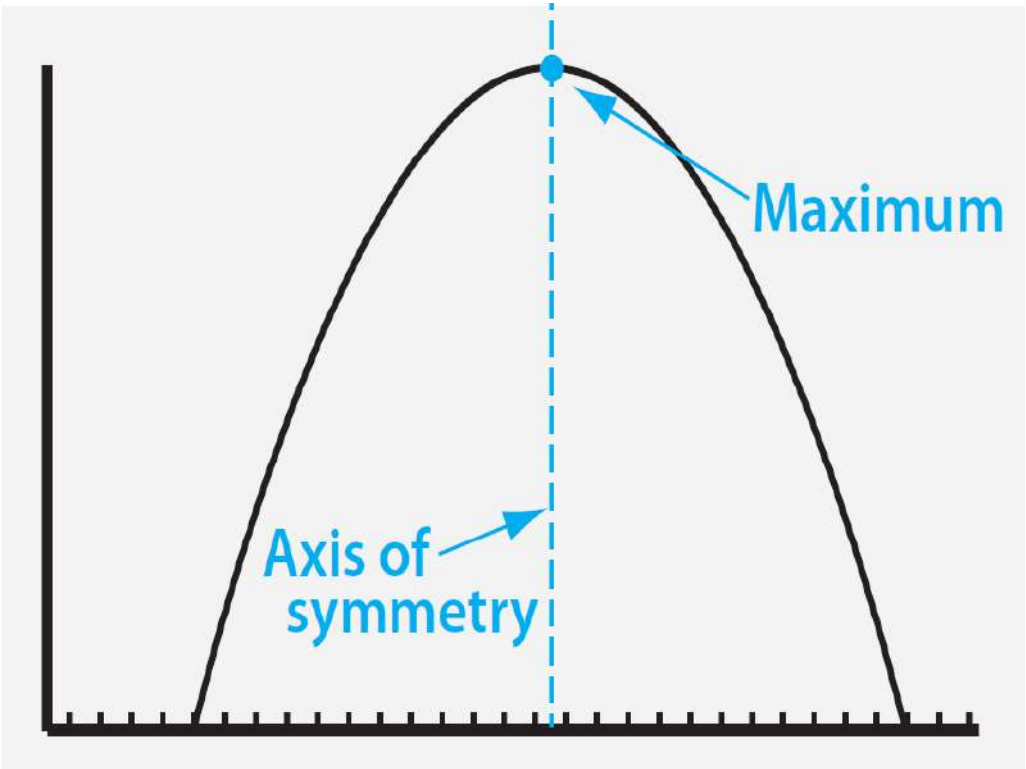
Parabola with a positive leading coefficient: the number in front of the first term = +a = up



Parabola with a negative leading coefficient:



Parabola with a negative leading coefficient: -a = down



Roots: AKA

Roots: AKA zeros,

Roots: **AKA zeros, solutions,**

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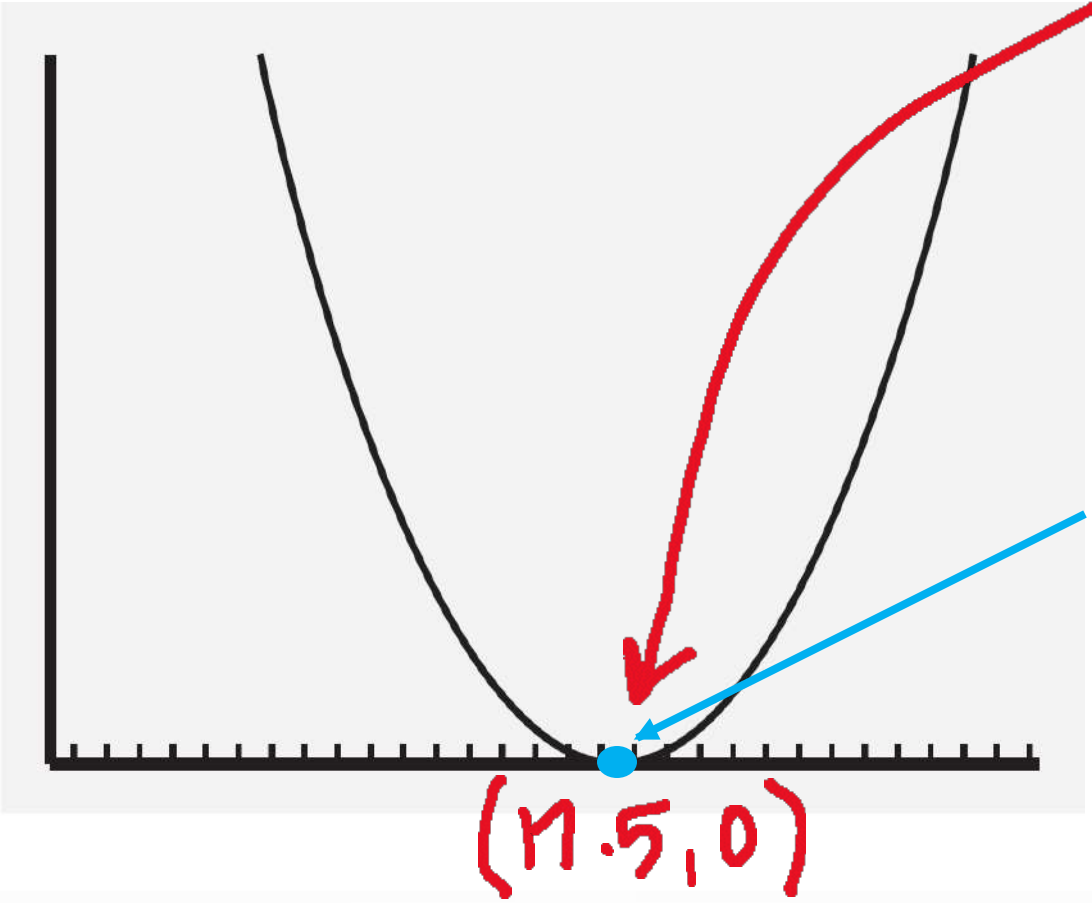
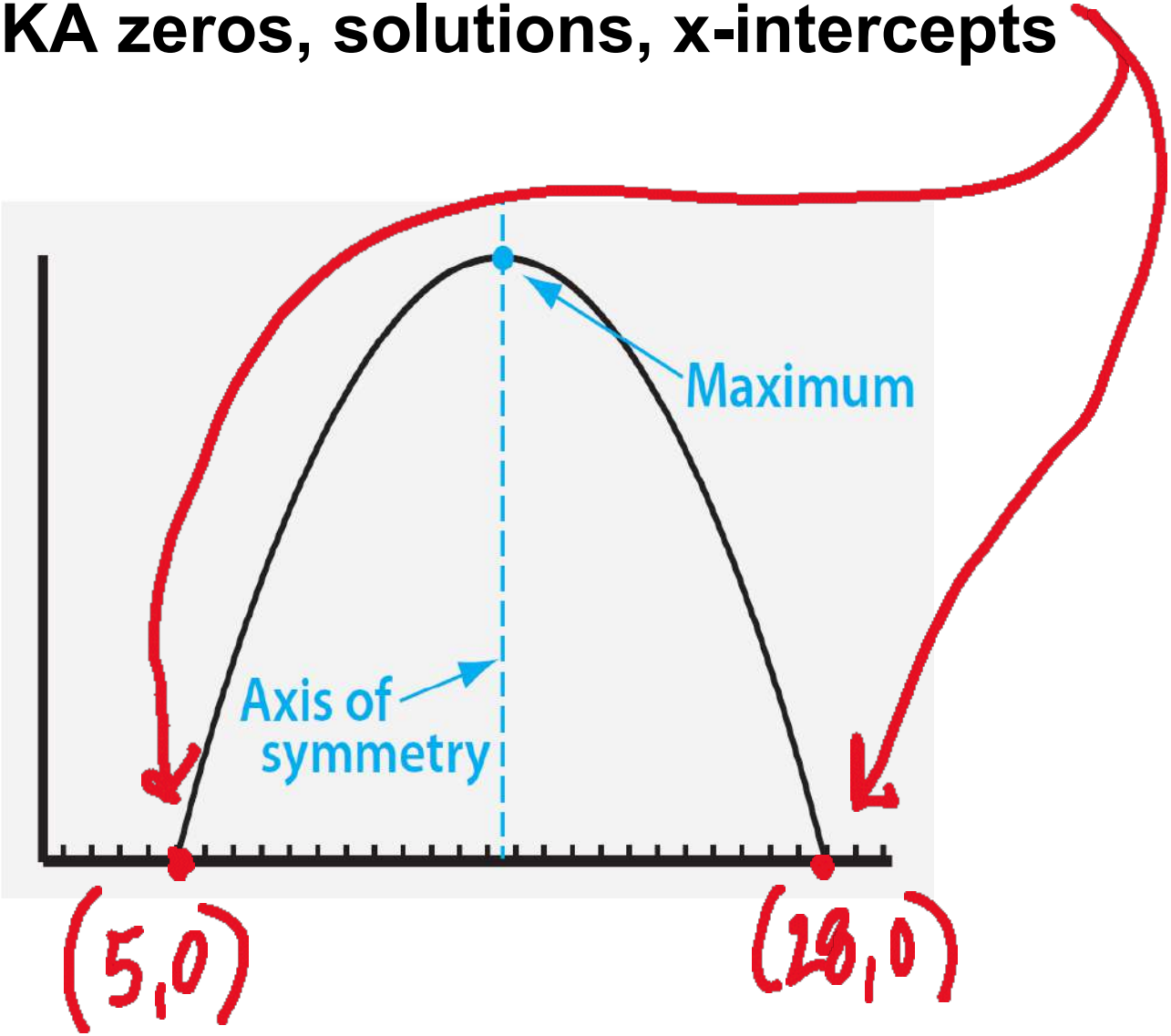


Roots: AKA zeros, solutions, x-intercepts



Roots: AKA zeros, solutions, x-intercepts

Ways to Find the Roots/Zeros:

Roots: AKA zeros, solutions, x-intercepts

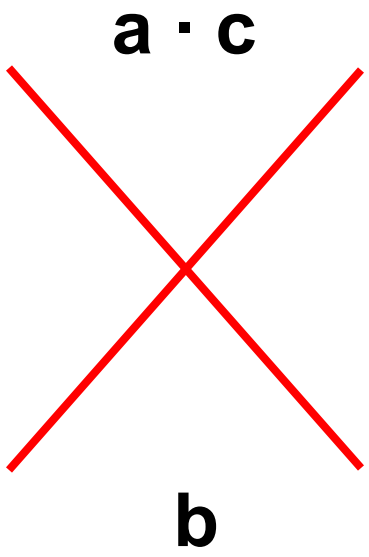
Ways to Find the Roots/Zeros:

1. **Factoring**

Roots: AKA zeros, solutions, x-intercepts

Ways to Find the Roots/Zeros:

1. Factoring – X-Box → (x +)(x +)



Roots: AKA zeros, solutions, x-intercepts

Ways to Find the Roots/Zeros:

1. **Factoring**
2. **Completing the Square**

Roots: AKA zeros, solutions, x-intercepts

Ways to Find the Roots/Zeros:

1. **Factoring**
2. **Completing the Square → $(x + \quad)^2 =$**

Roots: AKA zeros, solutions, x-intercepts

Ways to Find the Roots/Zeros:

1. **Factoring**
2. **Completing the Square**
3. **Quadratic Formula**

Watch this and sing along! ;)

https://www.youtube.com/watch?v=O8ezDEk3qCg

Roots: AKA zeros, solutions, x-intercepts

Ways to Find the Roots/Zeros:

1. **Factoring**
2. **Completing the Square**
3. **Quadratic Formula:** $= \dfrac{- \quad \pm\sqrt{\quad} \quad -}{\qquad\qquad}$

A. Find the roots to $x^2 + 6x = 0$ using all 3 methods.

1. Factoring:

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1. Factoring:

$x(x+6)=0$

$x=0$ $\quad x+6=0$

$-6 \quad -6$

$x=-6$

A. Find the roots to $x^2 + 6x = 0$ using all 3 methods.

2. Completing the Square:

A. Find the roots to $x^2 + 6x = 0$ using all 3 methods.

2. Completing the Square:

$x^2 + 6x + \boxed{9} = 0 + \boxed{9}$

$\left(\frac{6}{2}\right)^2 = 9 \rightarrow 3$

$x^2 + 6x + 9 = 0 + 9$

$\sqrt{(x+3)^2} = \sqrt{9}$

$x + 3 = \pm 3$

$-3 \quad -3$

$x = -3 \pm 3 = -3+3, -3-3 = 0, -6$

$a \cdot c$

$1 \cdot 9$

9

$3 \quad 3$

6

b

A. Find the roots to $x^2 + 6x = 0$ using all 3 methods.

3. Quadratic Formula:

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3. Quadratic Formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$ax^2 + bx + c = 0$$

$$1x^2 + 6x + 0 = 0$$

$$a = 1 \quad b = 6 \quad c = 0$$

$$= \frac{-6 \pm \sqrt{(-6)^2 - 4(1)(0)}}{2(1)}$$

$$= \frac{-6 \pm \sqrt{36}}{2} = \frac{-6 \pm 6}{2} = \frac{0}{2}, \frac{-12}{2}$$

$$= 0, -6$$