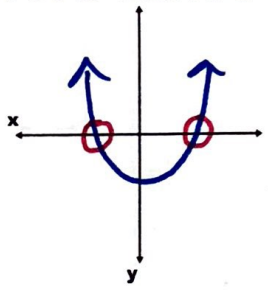
9-3 Graphing Quadratic Functions in FACTORED FORM

$$y = (x - r_1)(x - r_2)$$

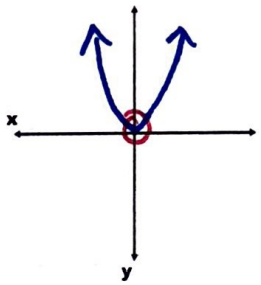
❒Zero of a Function

- AN x-VALUE THAT MAKES THE FUNCTION EQUAL TO 0.
- AN X-INTERCEPT OF THE FUNCTION (x WHEN y=0)
- A QUADRATIC FUNCTION MAY HAVE ONE, TWO, OR NO ZEROS

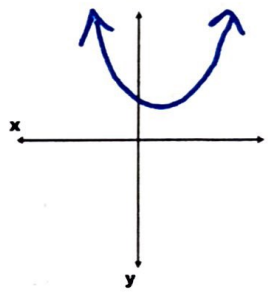
TWO ZEROS



ONE ZERO



NO ZEROS



❒Zero Product Property

- IF THE PRODUCT OF TWO QUANTITIES IS ZERO, AT LEAST ONE QUANTITY EQUALS 0. IF ab=0, THEN a=0 OR b=0.

EXAMPLES:

1) Find the zeros of $f(x) = 2x(x + 7)$

$2x = 0$ $\quad x = 0$

$x + 7 = 0$ $\quad -7 \quad -7$ $\quad x = -7$

THE ZEROS ARE (0,0) AND (-7,0)

$f(-7) = 2(-7)(-7+7)$
$= (-14)(0)$
$= 0$

2) Find the zeros of $f(x) = (x - 1)(x + 3)$

$x - 1 = 0$ $\quad x = 1$

$x + 3 = 0$ $\quad x = -3$

(1,0) AND (-3,0)

3) Find the zeros of $y = x^2 - 11x + 24$

$y = (x - 3)(x - 8)$

$x - 3 = 0$ $\quad x = 3$

$x - 8 = 0$ $\quad x = 8$

(3,0) AND (8,0)

❒Axis of Symmetry (AOS)

- A VERTICAL LINE THAT DIVIDES THE PARABOLA IN HALF
- ALWAYS PASSES THROUGH THE VERTEX (X-COORD.)
- YOU CAN USE THE ZEROS TO FIND AOS.

USING THE ZEROS TO FIND THE AXIS OF SYMMETRY

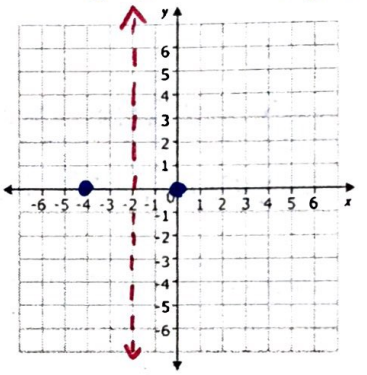
EXAMPLE: The zeros of a quadratic function are -4 and 0.

(-4,0) (0,0)

*USE THE AVERAGE OF THE ZEROS TO FIND AOS.

$x = \frac{-4+0}{2} = \frac{-4}{2} = -2$

$x = -2$



*GRAPH THE FUNCTIONS

1) Graph the function $f(x) = (x-1)(x+3)$

$x-1=0$ $\quad$ $x+3=0$

$+1\ +1$ $\quad$ $-3\ -3$

$x=1$ $\quad$ $x=-3$

$(1,0)$ $\quad$ $(-3,0)$

$f(0)=(0-1)(0+3)$

$=(-1)(3)$

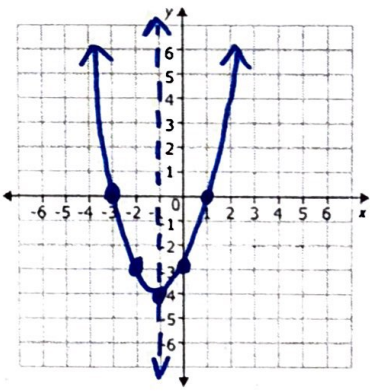
$=-3$ $\quad (0,-3)$

AOS $\Rightarrow x = \frac{1+(-3)}{2} = \frac{-2}{2} = -1$, $x=-1$

VERTEX $\Rightarrow$ $f(-1) = (-1-1)(-1+3)$

$= (-2)(2)$

$= -4$ $\quad (-1,-4)$



2) Graph the function $y = x^2 - 11x + 24$

$y=(x-3)(x-8)$

$x-3=0$ $\quad$ $x-8=0$

$+3\ +3$ $\quad$ $+8\ +8$

$x=3$ $\quad$ $x=8$

$(3,0)$ $\quad$ $(8,0)$

AOS $x = \frac{3+8}{2} = \frac{11}{2} = 5\frac{1}{2}$, $x = 5\frac{1}{2}$

VERTEX $\Rightarrow$ $(5.5, -6.25)$

$y=(\frac{11}{2})^2 - 11(\frac{11}{2}) + 24$

$= -6.25$

$y = 4^2 - 11(4) + 24$

$= 16 - 44 + 24$

$= -4$ $\quad (4,-4)$