Relative maximum value of y

Relative minimum value of y

x-intercepts: values of x for which $y = 0$

1) What is the relative maximum point? $(10,10)$

2) What is the relative maximum value?
   $y = 10$

1) Relative minimum point?
   $(-5, -5)$

2) Relative minimum value? $y = -5$

4 **EXAMPLE** **Finding Zeros of a Polynomial Function**

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

Factored
Form

$$0 = (x-2)(x+1)(x+3)$$

$$0 = x-2 \qquad 0 = x+1 \qquad 0 = x+3$$
$$+2 \qquad\qquad +2 \qquad -1 \qquad -1 \qquad -3 \qquad -3$$

$$\boxed{2 = x} \qquad \boxed{-1 = x} \qquad \boxed{-3 = x}$$

Factor Theorem

The expression $x - a$ is a linear factor of a polynomial if and only if the value a is a zero of the related polynomial function.

5 **EXAMPLE** **Writing a Polynomial Function From its Zeros**

Write a polynomial function in standard form with zeros at $-2, 3$, and 3.

Solutions

$$x = \cancel{-2} \quad x = \cancel{3} \quad x = \cancel{3}$$
$$+2 \quad +\cancel{2} \quad -3 \quad -\cancel{3} \quad -3 \quad -\cancel{3}$$

$$x + 2 = 0 \quad x - 3 = 0 \quad x - 3 = 0$$

Factored Form

$$\cancel{(x+2)}\cancel{(x-3)}(x-3) = y$$

Standard Form

	x	-3
x	x^2	$-3x$
2	$2x$	-6

$$\left(x^2 - \tfrac{1}{2}x - 6\right)(x-3) = y$$

	x^2	$-x$	-6
x	x^3	$-x^2$	$-6x$
-3	$-3x^2$	$3x$	18

$$\boxed{x^3 - 4x^2 - 3x + 18 = y}$$