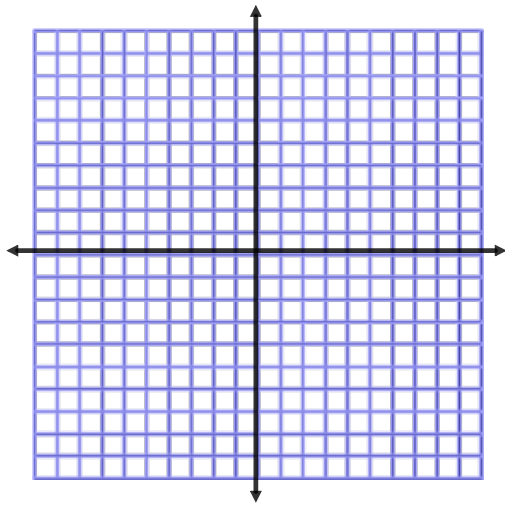


7.4 Part 2 Graphing Polynomials

What does it mean to be a zero of a polynomial?



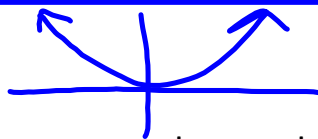
If k is a zero of a polynomial, then:

1. $x - k$ is a factor of $P(x)$.
2. $x = k$ is a solution/root (real or imaginary) of the equation $P(x) = 0$.
3. If k is a real root, then k is an x-intercept of the graph of $P(x)$.

Multiplicity of a Root

The multiplicity of a root is the same as the exponent on the factor.

$$f(x) = x^2$$



What happens to the graph at $x = 0$?

If the multiplicity is even, it "bounces" off the axis.

$$f(x) = x^3$$



What happens to the graph at $x = 0$?

If the multiplicity is odd, it crosses through the axis.

Sketch the graph of the function using its intercepts.

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

$$f(x) = \frac{1}{6}(x+3)(x-2)^2$$

fall → rise

Degree: 3

End Behavior:

$$f(x) \rightarrow -\infty \text{ as } x \rightarrow -\infty$$

$$f(x) \rightarrow \infty \text{ as } x \rightarrow \infty$$

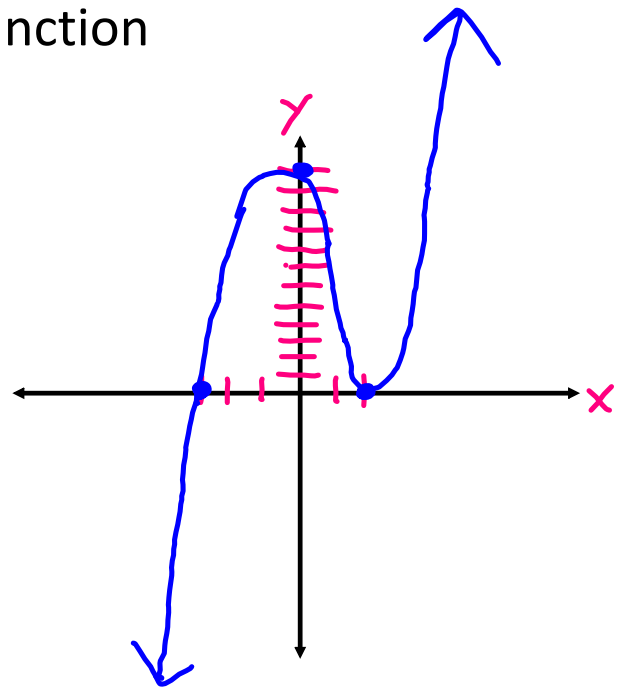
Zeros: -3 2
cross bounce

Max. # of turns: 2

y-intercept: 12

Set $x=0$
& solve

$$\begin{aligned} (0+3)(0-2)^2 \\ (3)(-2)^2 \\ (3)(4) \end{aligned}$$



Sketch the graph of the function using its intercepts.

$$f(x) = -(x+3)^2(x-1)(x-4)$$

fall → fall

Degree: 4

End Behavior:

$$f(x) \rightarrow -\infty \text{ as } x \rightarrow -\infty$$

$$f(x) \rightarrow -\infty \text{ as } x \rightarrow \infty$$

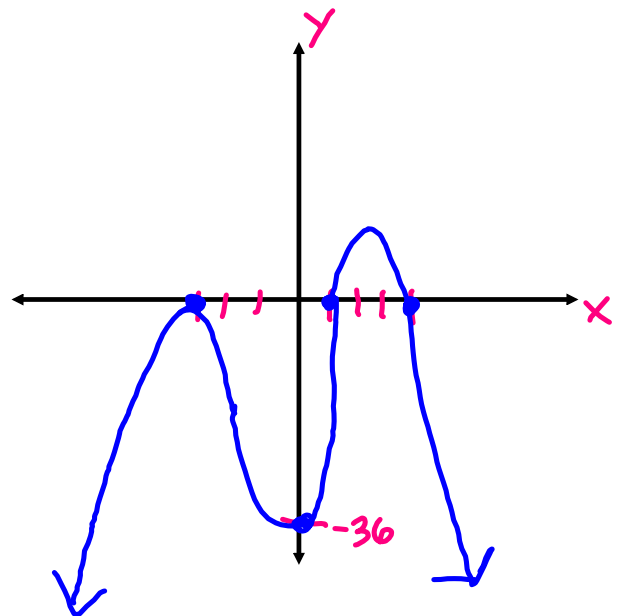
Zeros: -3 1 4
bounce cross cross

Max. # of turns: 3

y-intercept: -36

$$-(0+3)^2(0-1)(0-4)$$

$$-(9)(-1)(-4)$$



Sketch the graph of the function using its intercepts.

$$f(x) = x^4 - 3x^3 + 2x^2$$

$x^2(x^2 - 3x + 2)$ $x^2(x-2)(x-1)$
 rise rise

Degree: 4

End Behavior:

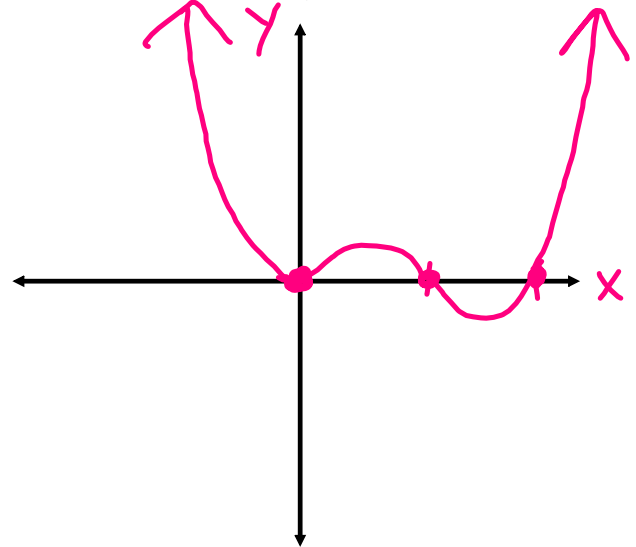
$$f(x) \rightarrow \infty \text{ as } x \rightarrow -\infty$$

$$f(x) \rightarrow \infty \text{ as } x \rightarrow \infty$$

Zeros: 0 2 1
 bounce cross cross

Max. # of turns: 3

y-intercept: 0



Sketch the graph of the function using its intercepts.

$$f(x) = (x^3 + 2x^2)(4x - 8)$$

$x^2(x+2)(x^2-4)$ $(x+2)(x-2)(x+2)$
 fall rise

Degree: 3

End Behavior:

$$f(x) \rightarrow -\infty \text{ as } x \rightarrow -\infty$$

$$f(x) \rightarrow \infty \text{ as } x \rightarrow \infty$$

Zeros: -2 2
 bounce cross

Max. # of turns: 2

y-intercept: -8

