

Polynomial Functions

Sketching &
Characteristics

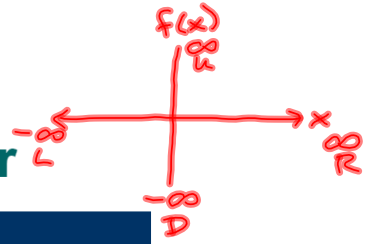
Zeros and Multiplicity

Multiplicity determines if a function crosses the x-axis or bounces off the x-axis.

Even Multiplicity:
the graph bounces off the x-axis at that zero/x-intercept

Odd Multiplicity:
the graph crosses through the x-axis at that zero/x-intercept

Degree and End-behavior



	Even degree	Odd Degree
Positive leading coefficient	<p>as $x \rightarrow \pm\infty$, $f(x) \rightarrow \infty$</p>	<p>as $x \rightarrow -\infty$, $f(x) \rightarrow -\infty$</p> <p>as $x \rightarrow \infty$, $f(x) \rightarrow \infty$</p> <p>Labels: LU, RU</p>
Negative leading coefficient	<p>as $x \rightarrow \pm\infty$, $f(x) \rightarrow -\infty$</p>	<p>as $x \rightarrow -\infty$, $f(x) \rightarrow \infty$</p> <p>as $x \rightarrow \infty$, $f(x) \rightarrow -\infty$</p> <p>Labels: LU, RD</p>

Example 1

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

- Zeros multiplicity cross/bounce?

1 2 bounce
-1 1 cross

- y-intercept? (0, 1)
 $f(0)$

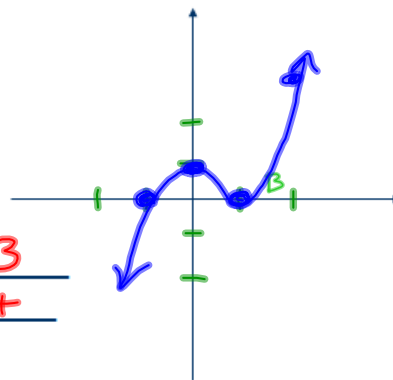
- Degree of Polynomial Function? 3

- Pos./Neg. Leading Coefficient? +

- Turning Points? 2

- Describe the end behavior?

as $x \rightarrow -\infty$,
 $f(x) \rightarrow -\infty$
as $x \rightarrow \infty$,
 $f(x) \rightarrow \infty$



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

$$f(0) = (-1)^2(1) = 1$$

$$f(2) = (1)^2(3) = 3$$

Example 2

$$f(x) = -\frac{1}{8}(x+1)(x-2)(x-4)$$

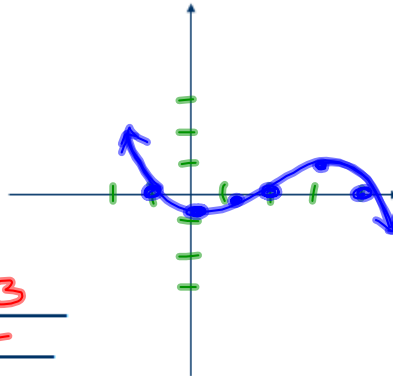
- Zeros multiplicity cross/bounce?

Zeros	multiplicity	cross/bounce?
<u>-1</u>	<u>1</u>	<u>Cross</u>
<u>2</u>	<u>1</u>	<u>Cross</u>
<u>4</u>	<u>1</u>	<u>Cross</u>

- y-intercept? (0, -1)
 $f(0)$

- Degree of Polynomial Function? 3
- Pos./Neg. Leading Coefficient? -
- Turning Points? 2
- Describe the end behavior?

as $x \rightarrow -\infty$,
 $f(x) \rightarrow \infty$
as $x \rightarrow \infty$,
 $f(x) \rightarrow -\infty$



$$f(x) = -\frac{1}{8}(x+1)(x-2)(x-4)$$

$$f(0) = -\frac{1}{8}(1)(-2)(-4) = -1$$

$$f(1) = -\frac{1}{8}(2)(-1)(-3) = -0.75$$

$$f(3) = -\frac{1}{8}(4)(1)(-1) = 0.5$$

Example 3

$$f(x) = -\frac{1}{10}x(x-3)^2(x+2)$$

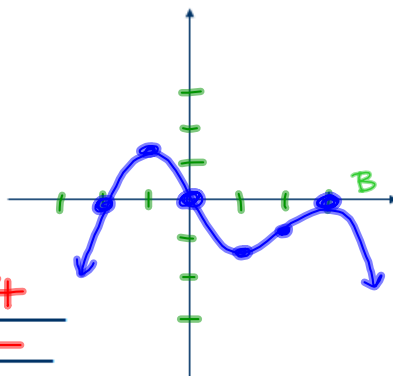
- Zeros multiplicity cross/bounce?

Zeros	multiplicity	cross/bounce?
<u>0</u>	<u>1</u>	<u>Cross</u>
<u>3</u>	<u>2</u>	<u>bounce</u>
<u>-2</u>	<u>1</u>	<u>cross</u>

- y-intercept? (0, 0)

- Degree of Polynomial Function? 4
- Pos./Neg. Leading Coefficient? -
- Turning Points? 3
- Describe the end behavior?

as $x \rightarrow \pm\infty$,
 $f(x) \rightarrow -\infty$



$$f(x) = -\frac{1}{10}x(x-3)^2(x+2)$$

$$f(-1) = \frac{1}{10}(-4)^2(1) = 1.6$$

$$f(1) = -\frac{1}{10}(-2)^2(3) = -1.2$$

$$f(2) = -\frac{1}{5}(-1)^2(4) = -0.8$$