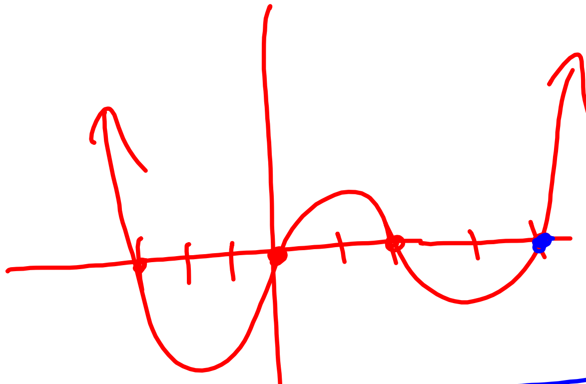
16.



$X+0$

$X-0$

deg: 4

$$\boxed{(x+3)x(x-2)(x-4)}$$

4.

-2	-1	-2	1	2
	$\downarrow$	2	0	-2
	-1	0	1	☺
	x^2	x	#	

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

3. $x^4 - 3x^3 - 10x^2$

$x^2(x^2 - 3x - 10)$

$1 \cdot -10 = -10$

$1 \quad 10$

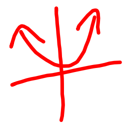
$+2 \quad -5$

$x^2(x+2)(x-5)$

$x^2 = 0$

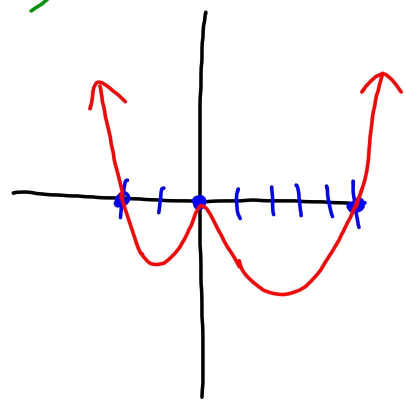
$x = 0$ m: 2
bounce

$x^4 +$



$x = -2$ m: 1

$x = 5$ m: 1



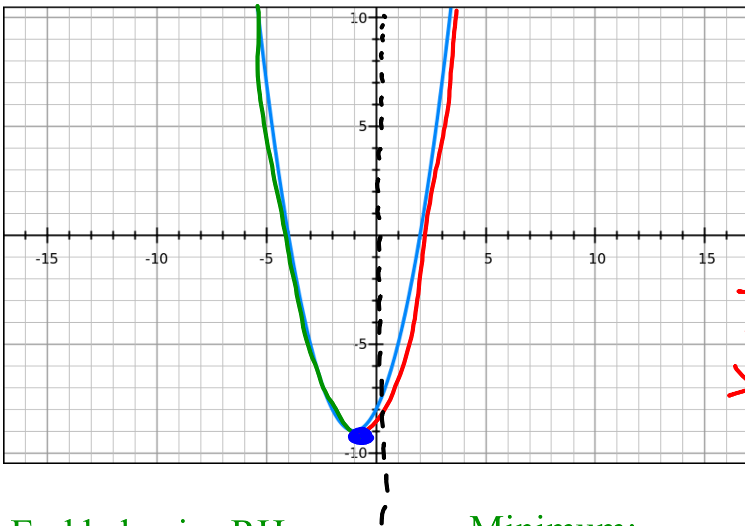
3-4 Function Analysis

Objectives: limit notation

I can identify the key features of a graph using the following vocabulary: end behavior (limits), multiplicity, increasing, decreasing, domain, range, odd, even, zeros/roots, maximums and minimums.

I can graph a polynomial function by hand and using technology

Analyze the following graph



x Domain: $(-\infty, \infty)$

y Range: $[-9, \infty)$

x-val

Increasing: $(-1, \infty)$

Decreasing: $(-\infty, -1)$

End behavior RH: ∞

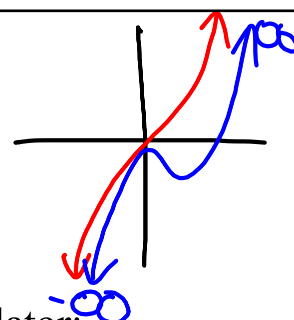
End behavior LH: ∞

Minimum: global $(-1, -9)$

Maximum: none

Symmetry: none

End Behavior:



Graph the following functions on your calculator:

$$f(x) = x^3 - 4x^2 - 5x - 3 \qquad g(x) = x^3$$

What happens as we continue to zoom out?

Where is each end going?

deg. 3 +

End Behavior (polynomial)

Limit notation

End Behavior is determined by the degree of the polynomial and the coefficient of the leading term. The mathematical notation is written using limits.

$\lim_{x\to-\infty} f(x) =$ left end

$\lim_{x\to\infty} f(x) =$ right end

Odd Degree: the left & right ends go in opp. directions

(+) coeff.

$\lim_{x\to\infty} f(x) = \infty$

$\lim_{x\to-\infty} f(x) = -\infty$

(-) coeff.

$\lim_{x\to\infty} f(x) = -\infty$

$\lim_{x\to-\infty} f(x) = \infty$

Even Degree: both ends go in the same direction

(+) coeff. both up

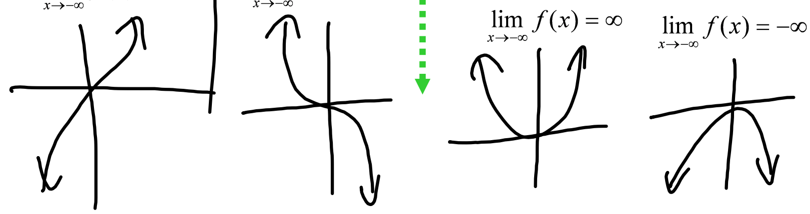
$\lim_{x\to\infty} f(x) = \infty$

$\lim_{x\to-\infty} f(x) = \infty$

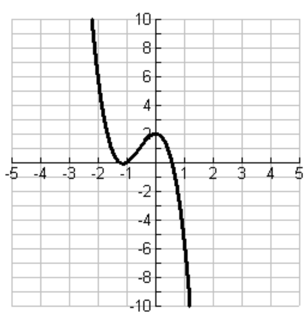
(-) coeff. both down

$\lim_{x\to\infty} f(x) = -\infty$

$\lim_{x\to-\infty} f(x) = -\infty$

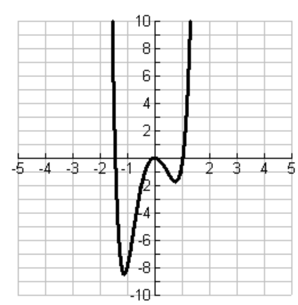


Name the degree & the sign of the coefficient of the leading term based on the end behavior:



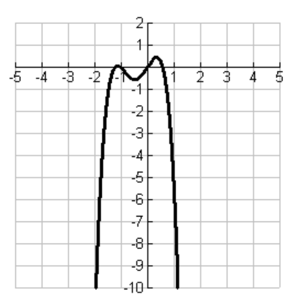
deg: odd

–



deg: even

+



deg: even

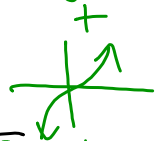
–

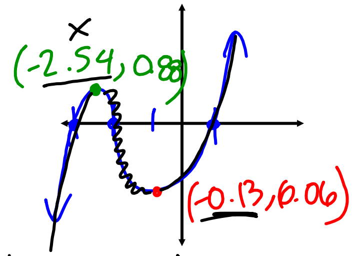
Find the zeros, graph and analyze including end behavior using limits:

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

$x = 1$ m: 1
$x: -2$ m: 1
$x: -3$ m: 1

deg: 3
+





*Domain:
$(-\infty, \infty)$

Increasing:
$(-\infty, -2.54) \cup (-0.13, \infty)$

*Range:
$(-\infty, \infty)$

Decreasing:
$(-2.54, -0.13)$

*Symmetry:
none

Maximum:
local
$(-2.54, 0.88)$

Minimum:
local
$(-0.13, 6.06)$

End behavior: limit

left $\lim_{x \to -\infty} f(x) = -\infty$

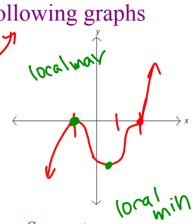
right $\lim_{x \to \infty} f(x) = \infty$

Graph and analyze the following graphs

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

$x: 2$ m: 3
$x: -1$ m: 2
bounce

x^5 +



Domain:

Increasing:

Range:

Decreasing:

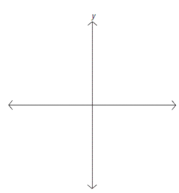
Symmetry:

Maximum:

End behavior:

Minimum:

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



Domain:

Increasing:

Range:

Decreasing:

Symmetry:

Maximum:

End behavior:

Minimum: