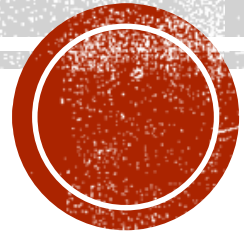
CHARACTERISTICS OF POLYNOMIAL FUNCTIONS

Keeper 15

GSE Honors Algebra II



DOMAIN & RANGE

*Domain = all of the x-values that can go INTO the function. [How wide does the graph spread?]

(left, right)

for all polynomials the domain is $(-\infty, \infty)$

*Range = all of the y-values you can get OUT of the function. Use the y-coordinate from the absolute minimum/maximum value to help you determine the range.

(lowest, highest)

*If the graph goes above the absolute minimum/ maximum value, then the range will be y ≥ y-coordinate.

*If the graph goes below the minimum/maximum value, then the range will be y ≤ y-coordinate.

INTERCEPTS

Ex: $y = x^2 - 5x + 4$

*x-intercept = the point (x, 0). You can find the value of x by plugging in zero for y and solving.

$0 = x^2 - 5x + 4$

$0 = (x-1)(x-4)$

$x = 1 \quad x = 4$

$(1,0)$ & $(4,0)$

The x-coordinate from the x-intercept is the REAL ZERO of the polynomial.

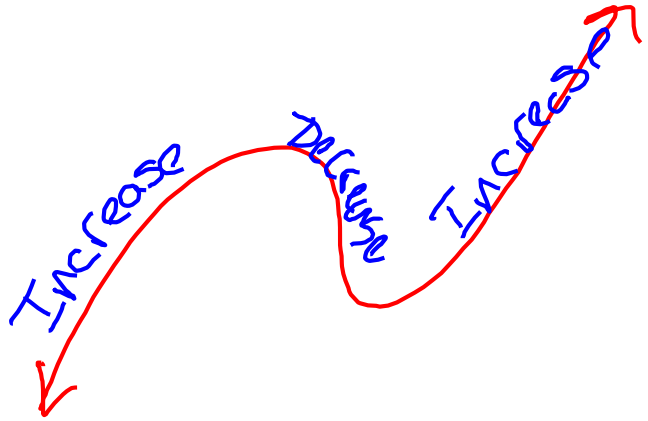
*y-intercept - the point (0, y). You can find the value of y by plugging in zero for x and solving.

$y = (0)^2 - 5(0) + 4$

$y = 4$ $(0,4)$

* always the constant

INTERVALS OF INCREASE/DECREASE

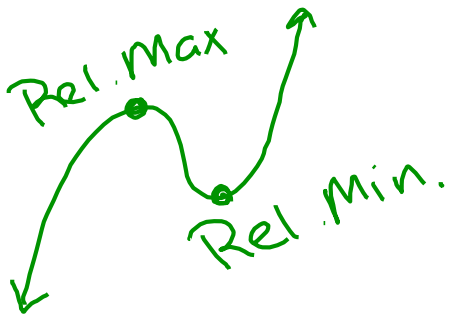


*Intervals of Increase - the x-values of the graph where it goes UP from left to right.

*Intervals of Decrease - the x-values of the graph where it goes DOWN from left to right.

Remember to join multiple intervals with a "u."

MAXIMUMS AND MINIMUMS



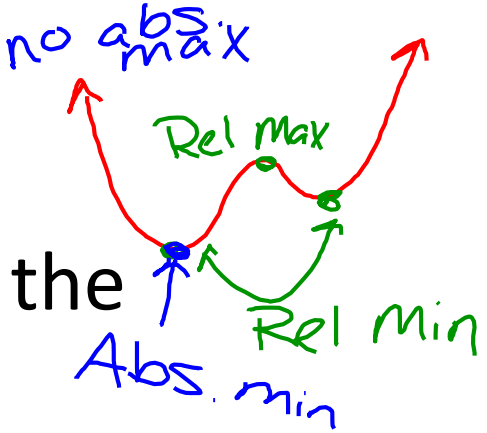
Relative Maximum/Minimum

*Relative Maximum - the highest point on a turn. peak

Local max

*Relative Minimum - the lowest point on a turn. valley

Local min



Absolute Maximum/Minimum

*Absolute Maximum - the highest point of all the points on the graph.

*Absolute Minimum - the lowest point of all the points on the graph.

EVEN/ODD FUNCTIONS

Even Functions

Eg: all exponents (including constant) are even

*have symmetry about the y-axis.

[If you folded the graph along the y-axis, the left side and right side would overlap.]

Odd Function

Eg: all exponents are odd

*have symmetry about the origin.

rotate 180°

[If you folded the graph along the x & y-axis, the graph would overlap itself.]

END BEHAVIOR:

Describes what f(x) does if you could follow the graph FOREVER!

$$\text{as } x \to \infty,\ f(x) \to \_\_\_\_\_$$

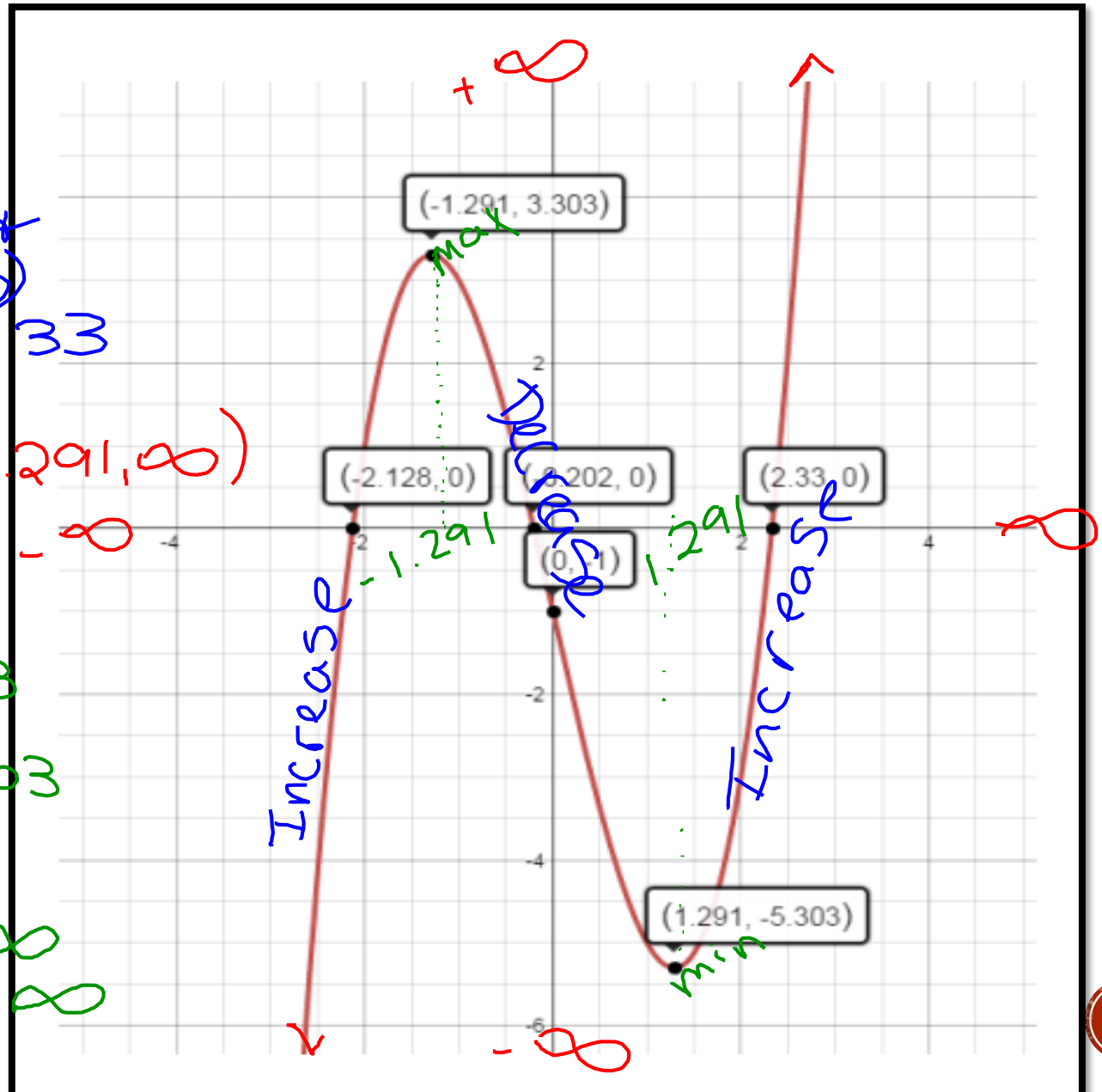
$$\text{as } x \to -\infty,\ f(x) \to \_\_\_\_\_$$

*If the arrow points up, use ∞.

*If the arrow points down, use - ∞.

EXAMPLE # 1: DESCRIBE THE CHARACTERISTICS FOR THE FUNCTION GIVEN BY THE GRAPH.

Domain	$(-\infty, \infty)$
Range	$(-\infty, \infty)$
X-intercept	$(-2.128, 0)$ $(-.202, 0)$ $(2.33, 0)$
Zeros	$x = -2.128$; $x = -.202$; $x = 2.33$
Y-intercept	$(0, -1)$
Intervals of Increase	$(-\infty, -1.291) \cup (1.291, \infty)$
Intervals of Decrease	$(-1.291, 1291)$
Relative Maximum	$(-1.291, 3.303)$ or $y = 3.303$
Relative Minimum	$(1.291, -5.303)$ or $y = -5.303$
Absolute Maximum	none
Absolute Minimum	none
Even/Odd	neither (symm.)
End Behavior	$x \to \infty, f(x) \to \infty$ $x \to -\infty, f(x) \to -\infty$



EXAMPLE # 2: DESCRIBE THE CHARACTERISTICS FOR THE FUNCTION GIVEN BY THE GRAPH.

Domain

Range

X-intercept

Zeros

Y-intercept

Intervals of Increase

Intervals of Decrease

Relative Maximum

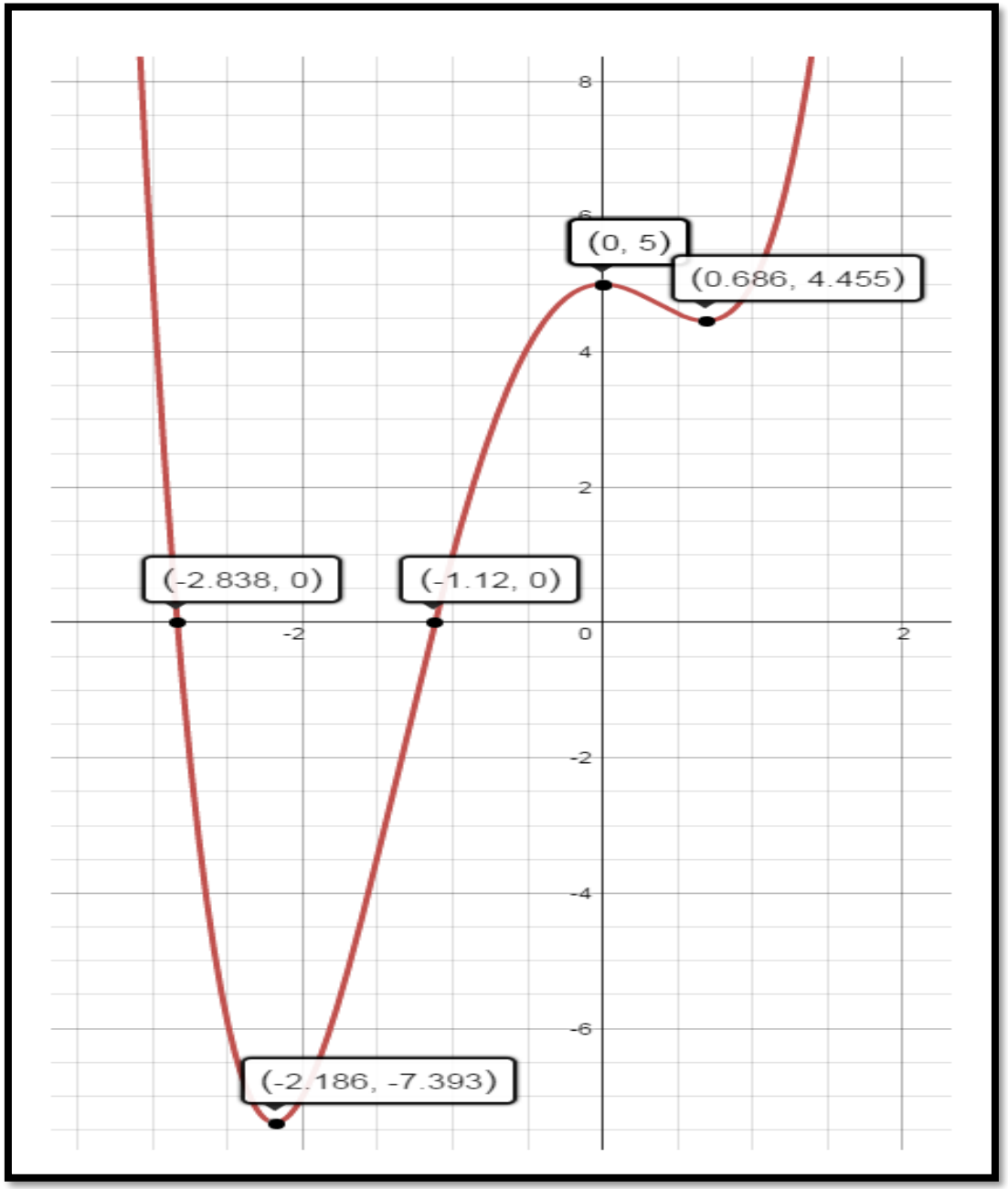
Relative Minimum

Absolute Maximum

Absolute Minimum

Even/Odd

End Behavior



EXAMPLE # 3: DESCRIBE THE CHARACTERISTICS FOR THE FUNCTION GIVEN BY THE GRAPH.

Domain

Range

X-intercept

Zeros

Y-intercept

Intervals of Increase

Intervals of Decrease

Relative Maximum

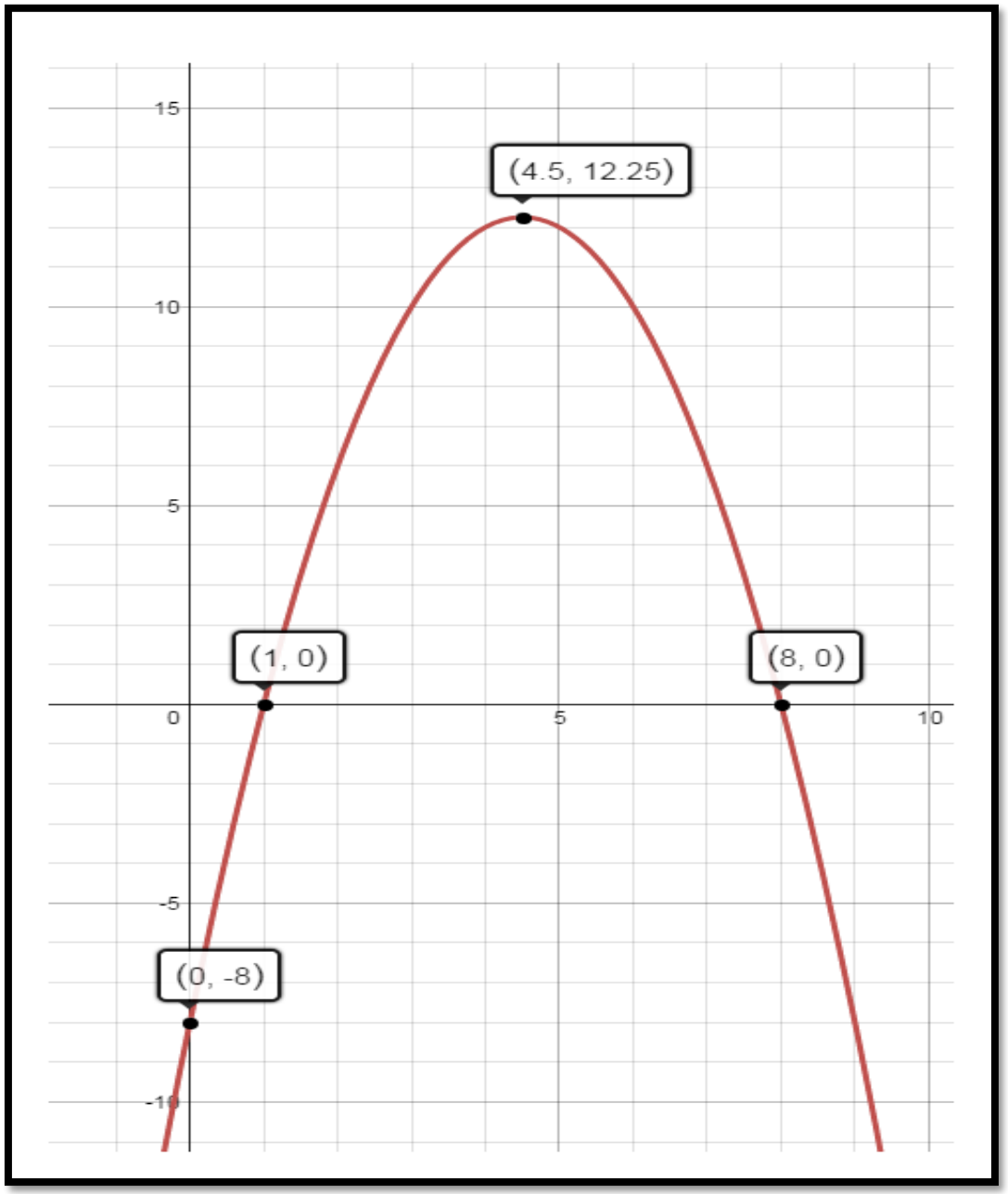
Relative Minimum

Absolute Maximum

Absolute Minimum

Even/Odd

End Behavior



EXAMPLE # 4: DESCRIBE THE CHARACTERISTICS FOR THE FUNCTION GIVEN BY THE GRAPH.

Domain

Range

X-intercept

Zeros

Y-intercept

Intervals of Increase

Intervals of Decrease

Relative Maximum

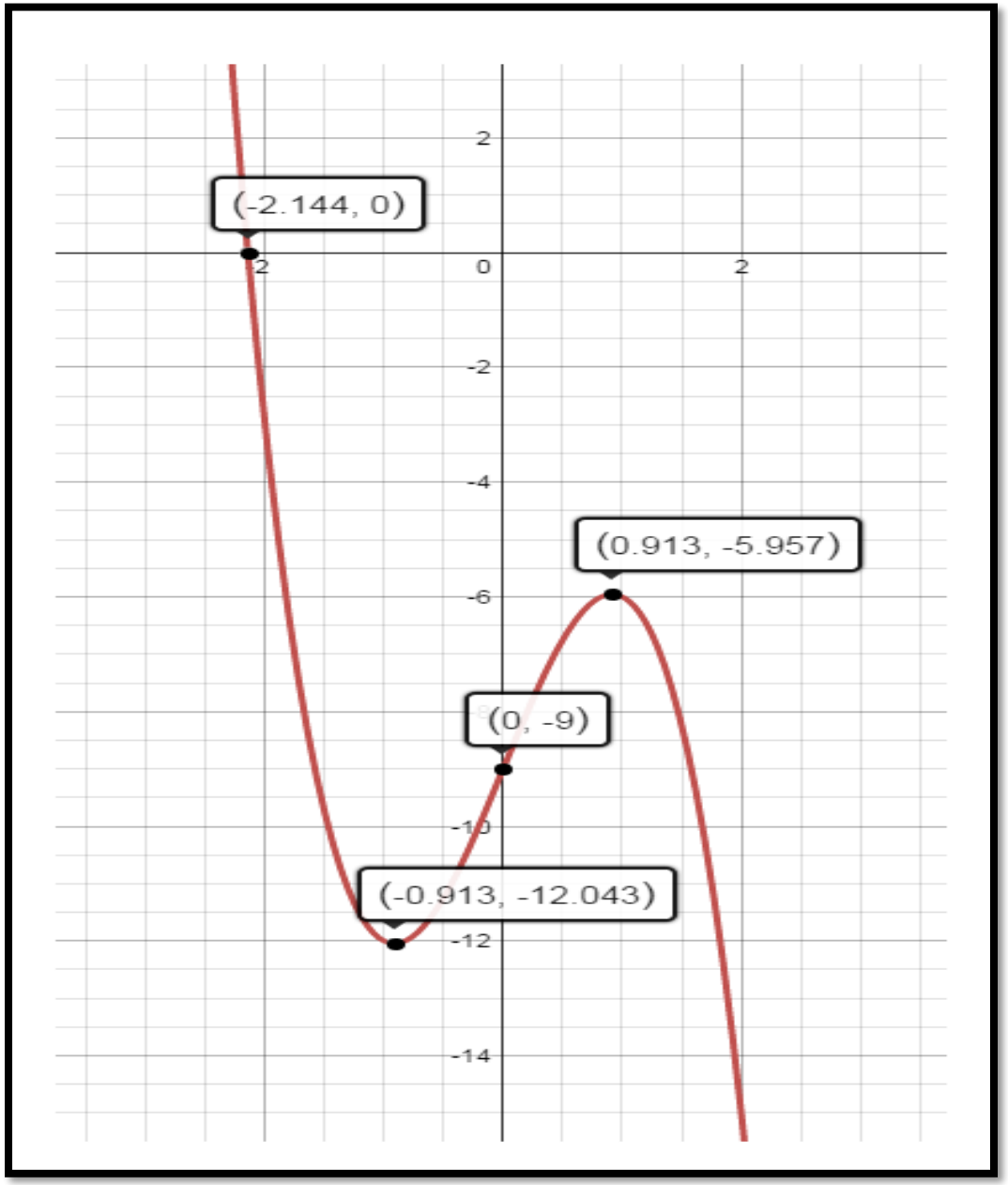
Relative Minimum

Absolute Maximum

Absolute Minimum

Even/Odd

End Behavior



$$f(x) = x^4 + x^3 - 11x^2 - 9x + 18$$

- Use your calculator to graph.
- Then state the following:
  - Domain
  - Range
  - Zeros
  - Relative Max
  - Relative Min
  - Intervals of Increase
  - Intervals of Decrease