Name: KEY Hour: ______ Date: ______

NOTES: Section 5.8 – Analyze Graphs of Polynomial Functions

Goals: #1 - I can graph a polynomial function by including x- and y-intercepts, and coordinates of local max/min.

#2 - I can identify the x-intercepts (real zeros), local max/min, and least degree, from a graph of a polynomial.

Homework: Lesson 5.8 Worksheet

Warm Up:

1. Find all zeros of the polynomial function $f(x) = x^4 + x^3 + 2x^2 + 4x - 8$

$\pm 1, \pm 2, \pm 4, \pm 8$

1	1	1	2	4	-8
	↓	1	2	4	8
	1	2	4	8	0

$x^3 + 2x^2 + 4x + 8$

-2	1	2	4	8
	↓	-2	0	-8
	1	0	4	0

$x^2 + 4$

$(x+2)(x-1)(x^2+4) = 0$

$\boxed{x = -2}$ $\boxed{x = 1}$ $x^2 + 4 = 0$

$x^2 = -4$

$\boxed{x = \pm 2i}$

Exploration #1: Work with a partner and answer the following questions.

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

1. What are the x-intercepts of this function?

$(-3, 0)$ $(2, 0)$

2. What is the y-intercept of this function?

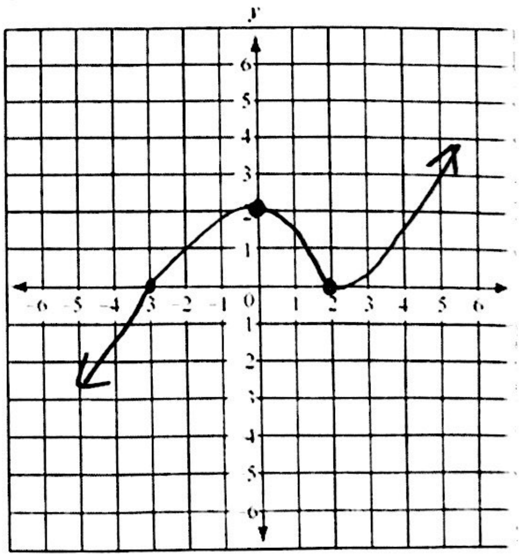
$(0, 2)$

3. Describe the end behavior of the graph of the function.

$f(x) \to$ $-\infty$ as $x \to -\infty$ ↗

$f(x) \to$ $+\infty$ as $x \to +\infty$ ↙

4. Using this information, graph the function below:



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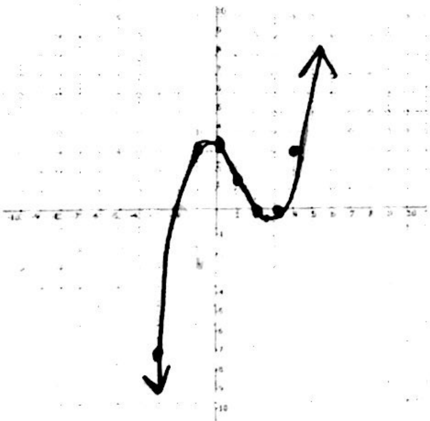
- zero: k is a zero of the polynomial function f.
- Factor: $x-k$ is a factor of the polynomial function f.
- Solution: k is a solution of the polynomial function f.
- x-intercept: If k is a real number, k is an x-intercept of the graph of the polynomial function f.

Example #1: Graph the function. Identify all intercepts. You must plot points between and beyond each intercept. Use the x/y table to identify points on the graph.

1. $h(x) = 0.25(x+2)(x-2)(x-3)$

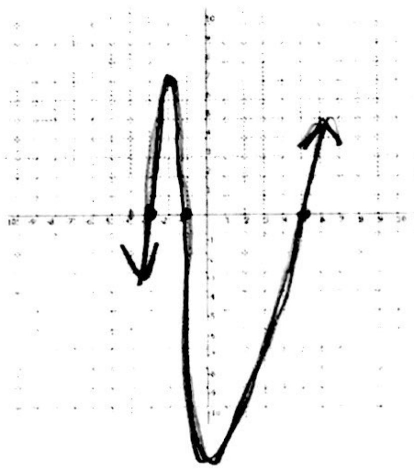


x-intercept(s): (-2,0)(2,0)(3,0)

y-intercept: (0, 3)

x	-3	-1	1	2.5	4			
y	-7.5	3	1.5	-0.3	3			

2. $f(x) = x^3 - x^2 - 17x - 15$



x-intercept(s): (-1, 0) (5, 0) (-3, 0)

y-intercept: (0, -15)

x	-4	-2	1	3	6			
y	-27	7	-32	-35	63			

±1, ±3, ±5, ±15

$$\begin{array}{r|rrrr} -1 & 1 & -1 & -17 & -15 \\ & \downarrow & -1 & 2 & 15 \\ \hline & 1 & -2 & -15 & \boxed{0} \end{array}$$

$x^2 - 2x - 15 = 0$

$(x-5)(x+3) = 0$

$\boxed{x=5}$ $\boxed{x=-3}$

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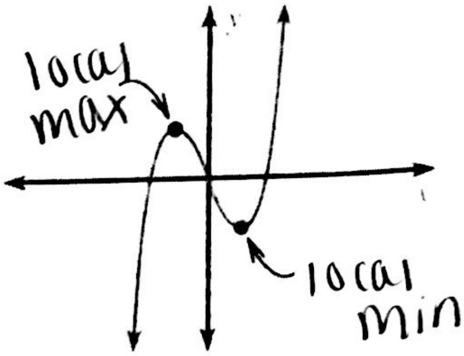
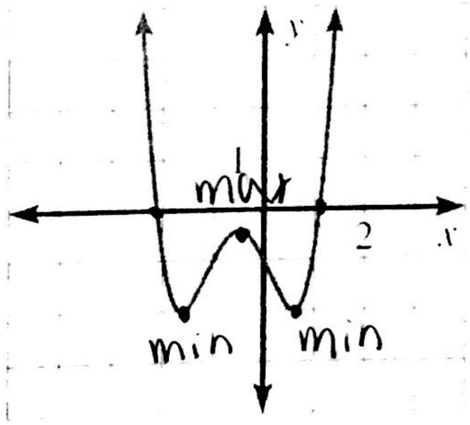
Another important characteristic of graphs of polynomial functions is that they have turning points corresponding to local maximum and local minimum values.

- The local maximum and minimum values are the y-coordinates of the turning points of the graph.



Example #2: Estimate the coordinates of each turning point and state whether each corresponds to a local maximum or a local minimum. Then estimate all real zeros and determine the least degree the function can have.

1.



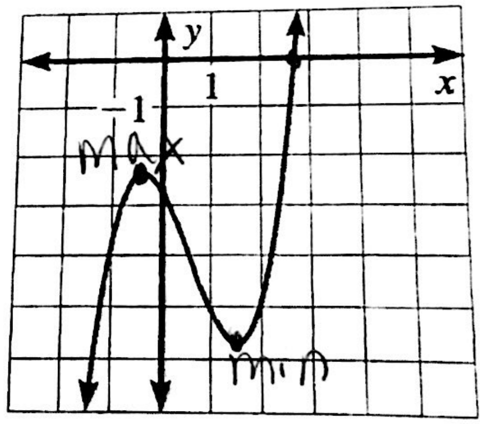
(-1.5, -2) min (-0.5, -0.5) max

(0.5, -2) min

real zeros: -2.1, 1.1

degree: 4

2.



(-0.5, -2.5) max (1.5, -6.5) min

real zeros: 2.7

degree: 3