Name:_____ Date: _____

End Behavior:

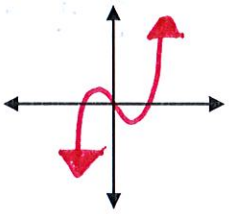
Look left and right, to figure out what's happening up and down.

right side → $x \to +\infty$ $f(x) \to$ _____
$x \to -\infty$ $f(x) \to$ _____ ← left side

} up or down
∞ $-\infty$

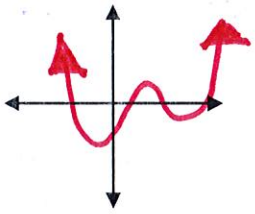
Graphically:

1.



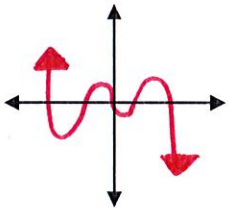
$x \to +\infty$ $f(x) \to \infty$
$x \to -\infty$ $f(x) \to -\infty$

2.



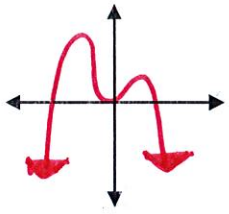
$x \to +\infty$ $f(x) \to \infty$
$x \to -\infty$ $f(x) \to \infty$

3.



$x \to +\infty$ $f(x) \to -\infty$
$x \to -\infty$ $f(x) \to \infty$

4.



$x \to +\infty$ $f(x) \to -\infty$
$x \to -\infty$ $f(x) \to -\infty$

Algebraically:

5. $f(x) =$ $\boxed{x^4} + 2x^2 - 3x$

positive → right ∞
+
even → same!

$x \to +\infty$ $f(x) \to \infty$
$x \to -\infty$ $f(x) \to \infty$

6. $f(x) =$ $\boxed{-x^5} + 3x^4 - x$

negative → right $-\infty$
+
odd → opposite!

$x \to +\infty$ $f(x) \to -\infty$
$x \to -\infty$ $f(x) \to \infty$

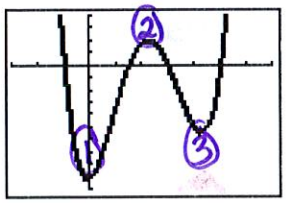
7. $f(x) =$ $\boxed{2x^3} - 3x^2 + 5$

positive → right ∞
+
odd → opposite

$x \to +\infty$ $f(x) \to \infty$
$x \to -\infty$ $f(x) \to -\infty$

Extrema: are turns in the graph.

- If you are given a graph, take the turns and add 1 to get the least possible degree of the polynomial.

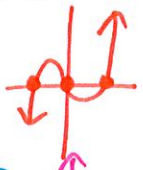


Least Possible Degree: x^{4} 4th degree

- If you are given the function, take the degree and subtract 1 to get the number of extrema.

$f(x) = 2x^{3} - 3x^{2} + 5$

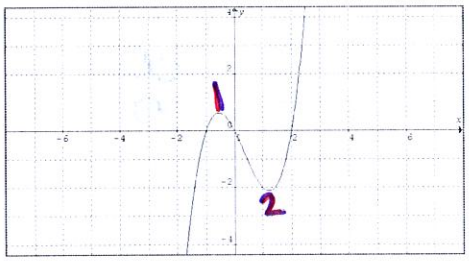
Number of Extrema: 3-1 = 2



2 turns!

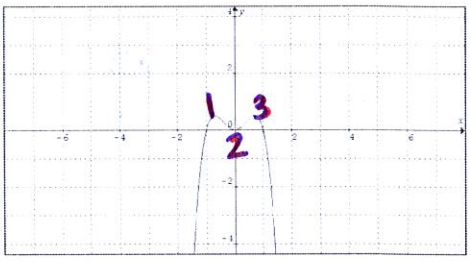
Graphically, what is the least possible degree?

8.



3

9.



4

Algebraically, what is the number of extrema?

10. $f(x) = x^{4} + 2x^{3} - 3x$

4-1 = 3

11. $f(x) = -x^{5} + 3x^{4} - x$

5-1 = 4

12. $f(x) = 2x^{3} - 3x^{2} + 5$

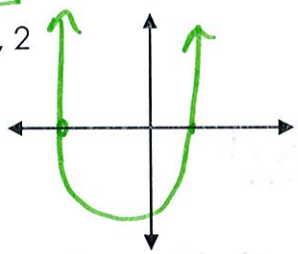
3-1 = 2

Sketching: Given the polynomial and zeros, sketch a graph and determine the characteristics

13. $f(x) = x^{2} + 8x - 20$

given zeros : $-10, 2$

positive & even



# of Zeros: 2 Y-Int: (0, -20)

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

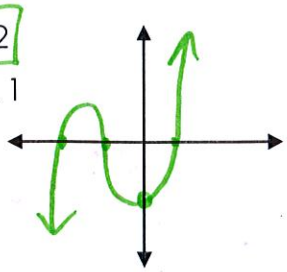
$x \to -\infty$ $f(x) \to \infty$ # of extrema 1

2-1 = 1

14. $f(x) = x^{3} + 2x^{2} - x - 2$

given zeros : $-2, -1, 1$

positive & odd



# of Zeros: 3 Y-Int: (0, -2)

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

$x \to -\infty$ $f(x) \to -\infty$ # of extrema 2

3-1 = 2