 Name: _____

5.1.D1 ~ Higher-Order Polynomial Functions

Numerical representations of either a linear or quadratic function are shown in a table. Find successive rates of change to determine if the function is linear, quadratic, or cubic. Identify intervals where the function is increasing and/or decreasing and concave up, concave down, or neither.

1. $f(x)$

x	$f(x)$	First Differences	Second Differences	Third Differences
-4	-48			
-3	-15	_____	_____	
-2	0	_____	_____	_____
-1	3	_____		
0	0			

Linear / Quadratic / Cubic

Increasing: ____ ≤ x ≤ ____

Decreasing: ____ ≤ x ≤ ____

Concave Up

Concave Down

Neither

2. $g(x)$

x	$g(x)$	First Differences	Second Differences	Third Differences
1	9			
2	16	_____	_____	
3	21	_____	_____	_____
4	24	_____		
5	25			

Linear / Quadratic / Cubic

Increasing: ____ ≤ x ≤ ____

Decreasing: ____ ≤ x ≤ ____

Concave Up

Concave Down

Neither

3. $g(x)$

x	$g(x)$	First Differences	Second Differences	Third Differences
1	5			
2	15	_____	_____	
3	25	_____	_____	_____
4	35	_____		
5	45			

Linear / Quadratic / Cubic

Increasing: ____ ≤ x ≤ ____

Decreasing: ____ ≤ x ≤ ____

Concave Up

Concave Down

Neither

4. $h(x)$

x	$g(x)$	First Differences	Second Differences	Third Differences
1	0			
2	-6	_____	_____	
3	-8	_____	_____	_____
4	0	_____		
5	24			

Linear / Quadratic / Cubic

Increasing: ____ ≤ x ≤ ____

Decreasing: ____ ≤ x ≤ ____

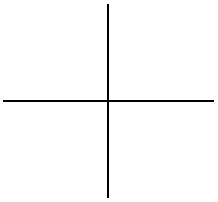
Concave Up

Concave Down

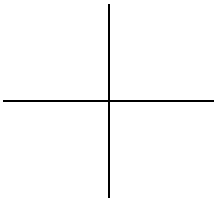
Neither

Sketch the graph of a polynomial function that has the given characteristics.

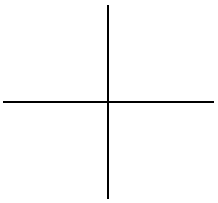
5. Third degree
   As $x \to \infty, f(x) \to -\infty$
   1 maximum
   1 minimum



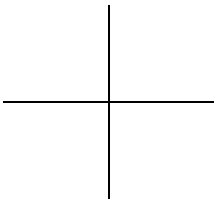
6. Fourth degree
   As $x \to \infty, f(x) \to -\infty$
   2 maximums
   1 minimum
   $f(x) = 0$ exactly twice



7. Fourth degree
   A zero @ 3
   Maximum @ $x = 2$
   Minimum @ $x = -1$

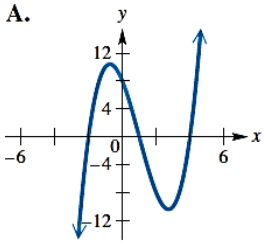


8. Fifth degree
   Zeros @ -4, -1, & 3
   Maximum @ $x = -2$

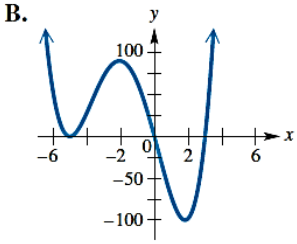


Problems 9 – 17, use graphs A – D:

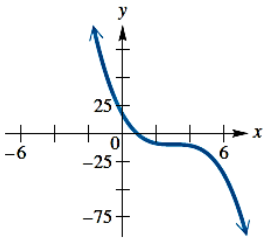
A.



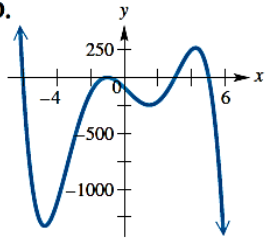
B.



C.



D.



9. Which graph(s) are that of an odd-degree polynomial function?

10. Which one of the graphs shows a polynomial function with no maximum or minimum values?

11. Which one of the graphs is that of a function whose range is *not* $(-\infty, \infty)$?

12. Which one of the graphs has the most turning points/local extrema?

13. Which graph(s) have an end behavior of $\lim_{x \to -\infty} f(x) = -\infty$?

14. Which graphs have an equal amount of x-intercepts?

15. Which one of the graphs shows that $f(x)$ is a polynomial function with $f(x) = 0$ at exactly three different values of x, and $f(x) \to \infty$ as $x \to \pm\infty$?

16. Which graphs have only one inflection point?

17. Recall that the graph of a polynomial function of degree n will have at most $n - 1$ turning points (local extrema). What is the degree of graph D?