

5.1.2 – The Behavior of Polynomial Functions

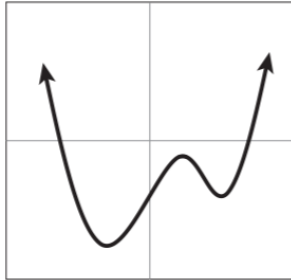
Is the function a polynomial? If so, identify its degree.

1. $a(x) = x^5 - \sqrt{3}x^2 + 2$

2. $b(x) = 4x^2 - 7\sqrt{x^5}$

3. $d(x) = 6x^3 + 2^x - 4$

4. Miguel identified the graph below as a polynomial function $f(x) = ax^4 - bx^2 + c$, where a , b , and c are positive real numbers.



Which reason best describes why Miguel is INCORRECT?

- a. The graph is not a fourth degree polynomial.
- b. The leading coefficient of Miguel's polynomial should be negative.
- c. The graph is of an even function, but Miguel's polynomial is not even.
- d. The y -intercept is below the x -axis, so Miguel's polynomial should end with $-c$ NOT $+c$.

Use the Leading Term Test to determine the long-run/end behavior of the graph of the polynomial function.

Function	End behavior	
	$\lim_{x \rightarrow -\infty}$	$\lim_{x \rightarrow \infty}$
5. $f(x) = 5x^3 + 7x^2 + 9$		
7. $f(x) = 3x^4 - 5x^2 + 3$		
9. $f(x) = (x - 3)^2(x + 5)^4$		
11. $f(x) = (x^2 - 1)(4 - x^2)$		

Function	End behavior	
	$\lim_{x \rightarrow -\infty}$	$\lim_{x \rightarrow \infty}$
6. $f(x) = -11x^4 - 6x^2 + x$		
8. $f(x) = -x^3 - 4x + 100$		
10. $f(x) = -x^6(x - 2)$		
12. $f(x) = (2 - x)^3$		

Use your knowledge of the behavior of polynomial functions to match each function to its graph.

13. $y = -2x^3 - 4x^2 + 1$

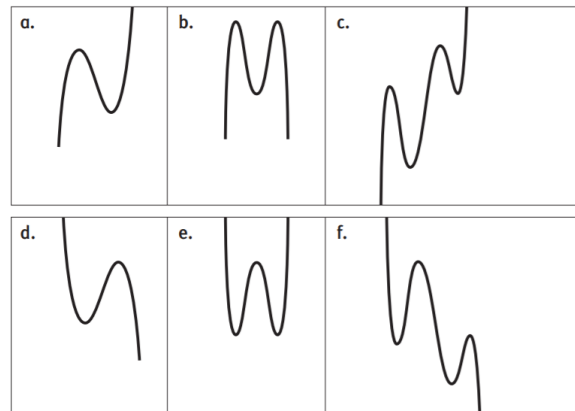
14. $y = 2x^3 - 4x^2 + 1$

15. $y = -3x^4 + 8x^2 + 1$

16. $y = 3x^4 - 8x^2 + 1$

17. $y = -2x^5 - 4x^4 + 5x^3 + 8x^2 - 5x$

18. $y = 2x^5 + 4x^4 - 5x^3 - 8x^2 + 5x$



Identify the leading term of each polynomial function and state its degree. Find the zeros and give the multiplicity for each. State whether the graph crosses the x -axis, or touches the x -axis and turns around, at each zero. What is the long-run/end behavior?

FUNCTION	LEADING TERM	DEGREE	ZEROS	MULT.	CROSSES OR TOUCHES	END BEHAVIOR	
						$\lim_{x \rightarrow -\infty} f(x)$	$\lim_{x \rightarrow \infty} f(x)$
19. $f(x) = x(x - 3)^2$							
20. $f(x) = -x^3(x - 2)$							
21. $f(x) = (x - 1)^3(x + 2)^2$							
22. $f(x) = 7(x - 3)^2(x + 5)^4$							

Use your knowledge of zeros and multiplicity of polynomial functions to match each function to its graph.

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

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

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

26. $f(x) = x(x + 1)(x - 3)(x - 5)$

