AP Precalc

Write your questions and thoughts here!

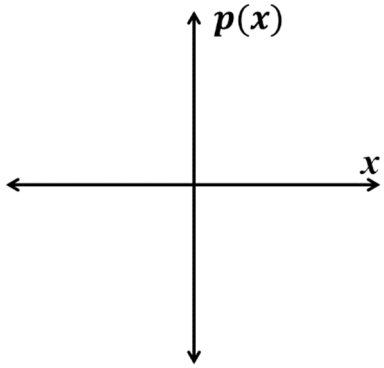
1.6 Polynomial Functions and End Behavior

1.6 Notes

Today's lesson is focused on the shape of polynomial graphs and how to describe their end behaviors.

The "left" and "right" side of a polynomial function graph will either go "up" or "down".

The Left Side
The x values are approaching negative infinity. The notation is:

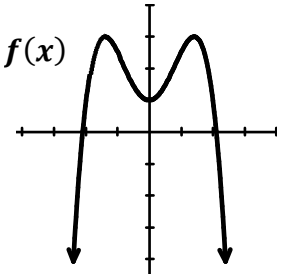


The Right Side
The x values are approaching positive infinity. The notation is:

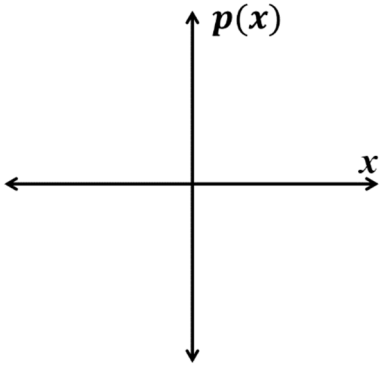
As the x-values approach negative infinity or positive infinity, do the y-values get larger or smaller? (Does the left side of the graph go up or down?) The following chart is how we describe the end behavior with fancy mathematical notation.

	Left side	**Right side**
Up		
Down		

1. Use the graph of $f(x)$, shown to the right, and describe its end behavior using limit notation.



2. Using the axis to the right, draw an example of a polynomial function that matches the statements $\lim_{x\to-\infty} p(x) = \infty$ and $\lim_{x\to\infty} p(x) = -\infty$.



Write your questions and thoughts here!

You don't need a graph to describe the end behaviors of a polynomial function. You only need to recognize the _____.

The leading term contains the variable with the largest exponent. As $x \to \infty$ or $x \to -\infty$, this leading term dominates all the other smaller terms. We don't need to worry about the smaller terms. In other words…

$$p(x) = 7x^6 - 4x^5 + 8x^4 + x^3 - 3x^2 - 9x + 10$$

If the leading term has an _____ degree, the left and right side will behave the _____.

	Left side $x \to -\infty$	Right side $x \to \infty$
EVEN degree and **positive** leading coefficient $p(x) = x^2$		
EVEN degree and **negative** leading coefficient $p(x) = -x^2$		

If the leading term has an _____ degree, the left and right side will behave the _____.

	Left side $x \to -\infty$	Right side $x \to \infty$
ODD degree and **positive** leading coefficient $p(x) = x^3$		
ODD degree and **negative** leading coefficient $p(x) = -x^3$		

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Describe the end behavior of each polynomial function using limit notation.

3. $p(x) = -x^3 - x^2 + x$

4. $p(x) = 6x^5 - x^4 + 1$

5. $p(x) = -3x^4 + x^3 + x - 2$

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AP Precalculus

1.6 Practice

Describe the end behavior of each function using limit notation.

1. $g(x) = 4x^7 - 3x^4 + x$

2. $p(x) = 7x^4 + 3x^3 - 3x - 4$

3. $f(x) = -7x^9 - 8x^3 + 6$

4. $g(x) = -3x^6 + 5x^3 - 2x + 6$

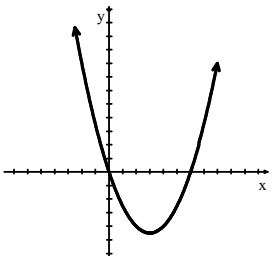
5. $f(x) = x^3 + 4x^2 - 3$

6. $p(x) = -8x^2 - 3x + 10$

7. $p(x) = -6x^5 + x^4 + 5x^2 - 4$

8. $f(x) = 3x^2 + 8x + 11$

9.



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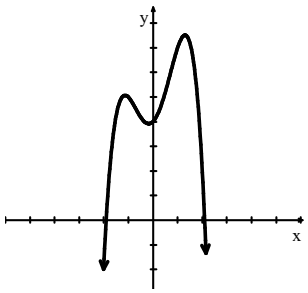

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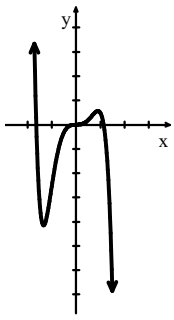
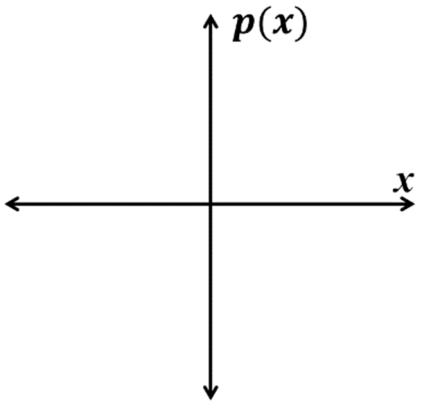
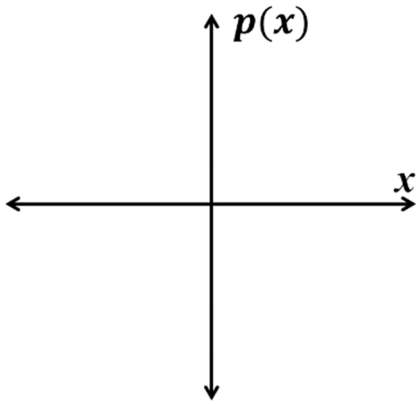


Sketch the graph of a polynomial function that could match each statement.

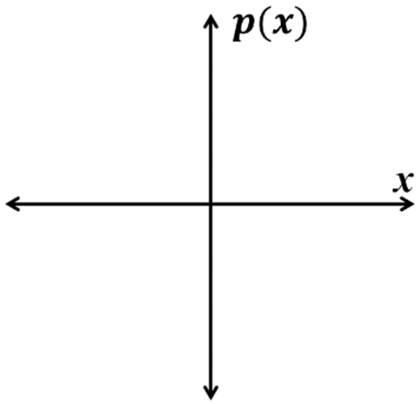
12. $\lim_{x\to-\infty} p(x) = -\infty$ and $\lim_{x\to\infty} p(x) = \infty$



13. $\lim_{x\to-\infty} p(x) = -\infty$ and $\lim_{x\to\infty} p(x) = -\infty$



14. $\lim_{x\to-\infty} p(x) = \infty$ and $\lim_{x\to\infty} p(x) = -\infty$



1.6 Polynomial Functions and End Behavior

1.6 Test Prep

15. The following polynomial function f is given by $f(x) = -7x^6 + 2x^2 + 4$. Which of the following statements about the end behavior of f is true?

(A) The sign of the leading term of f is positive, and the degree of the leading term of f is even; therefore, $\lim_{x\to-\infty} f(x) = \infty$ and $\lim_{x\to\infty} f(x) = \infty$.

(B) The sign of the leading term of f is negative, and the degree of the leading term of f is odd; therefore, $\lim_{x\to-\infty} f(x) = \infty$ and $\lim_{x\to\infty} f(x) = -\infty$.

(C) The sign of the leading term of f is positive, and the degree of the leading term of f is odd; therefore, $\lim_{x\to-\infty} f(x) = -\infty$ and $\lim_{x\to\infty} f(x) = \infty$.

(D) The sign of the leading term of f is negative, and the degree of the leading term of f is even; therefore, $\lim_{x\to-\infty} f(x) = -\infty$ and $\lim_{x\to\infty} f(x) = -\infty$.