

# 1.1 - Polynomial Functions

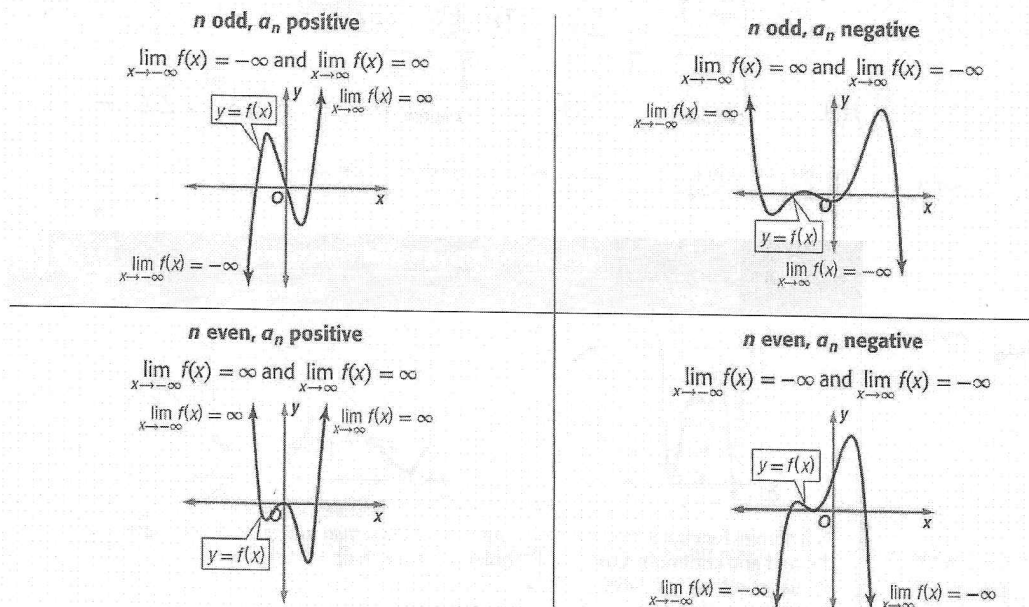
Polynomial Functions – the sums and differences of monomial functions

Degree of a Polynomial – the term with the highest variable exponent

Leading Coefficient – the coefficient of the variable with the highest exponent

Leading Term Test for Polynomial End Behavior

The end behavior of any non-constant polynomial function  $f(x) = a_n x^n + \dots + a_1 x + a_0$  can be described in one of the following four ways, as determined by the degree  $n$  of the polynomial and its leading coefficient  $a_n$ .



Example 1 Apply the leading term test

a.  $f(x) = 3x^4 - 5x^2 - 1$   $a_n = 3$ , positive  $n = 4$ , even

(L)  $\lim_{x \rightarrow -\infty} f(x) = \infty$

(R)  $\lim_{x \rightarrow \infty} f(x) = \infty$

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

$a_n = -2$ , negative  $n = 7$  odd

(L)  $\lim_{x \rightarrow -\infty} f(x) = -\infty$

(R)  $\lim_{x \rightarrow \infty} f(x) = -\infty$

c.  $f(x) = x^3 - 2x^2$

$a_n = 1$ , positive  $n = 3$ , odd

(L)  $\lim_{x \rightarrow -\infty} f(x) = -\infty$

(R)  $\lim_{x \rightarrow \infty} f(x) = \infty$

HW: 12-21

Describe the end behavior of the graph of each polynomial function using limits. Explain your reasoning using the leading term test. (Example 2)

12.  $f(x) = -5x^7 + 6x^4 + 8$

13.  $f(x) = 2x^6 + 4x^5 + 9x^2$

14.  $g(x) = 5x^4 + 7x^5 - 9$

15.  $g(x) = -7x^3 + 8x^4 - 6x^6$

16.  $h(x) = 8x^2 + 5 - 4x^3$

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

18.  $f(x) = x(x + 1)(x - 3)$

19.  $g(x) = x^2(x + 4)(-2x + 1)$

20.  $f(x) = -x(x - 4)(x + 5)$

21.  $g(x) = x^3(x + 1)(x^2 - 4)$