MATH 1314

Chapter 3.2: Polynomial Functions And Their Graphs

$$f(x) = a_n x^n + a_{n-1} x^{n-1} + a_2 x^2 + a_1 x + a_0$$

Exponents are positive integers

Smooth, continuous graph

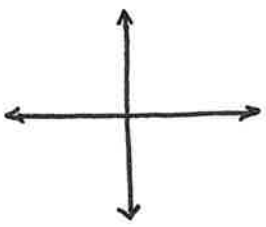
$f(x) = -3x^5 + \sqrt{2}x^2 + 5$ $\qquad$ $f(x) = -3\sqrt{x} + \sqrt{2}x^2 + 5$

$f(x) = -3x^4(x-2)(x+3)$ $\qquad$ $f(x) = -\frac{3}{x^2} + \sqrt{2}x^2 + 5$

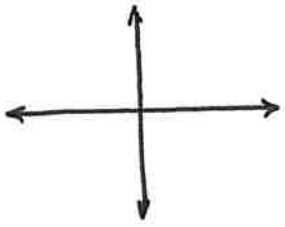
End Behavior: Leading Coefficient Test

$f(x) = ax^n$

n is even

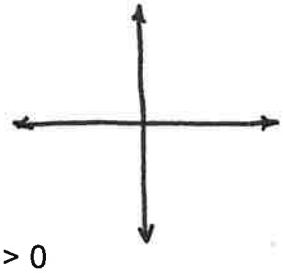


a > 0

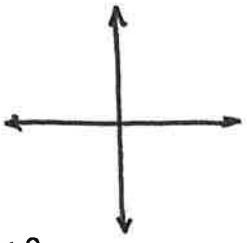


a < 0

n is odd



a > 0



a < 0

Note: A polynomial of degree n has maximum n – 1 turning points.

Examples: find the end behavior of the following.

$f(x) = x^3 + 3x^2 - x - 3$ $\qquad$ $-4x^3(x-1)^2(x+5)$ $\qquad$ $f(x) = 2x^3(x-1)(x+5)$

Zeros – Roots – Solutions

The values of x for which f(x) = 0.

Find the zeros of $f(x) = x^3 + 3x^2 - x - 3$.

Find the zeros of $f(x) = -x^4 + 4x^3 - 4x^2$.

Root Multiplicity: Even Power Odd Power

Intermediate Value Theorem

With f(x), if f(a) and f(b) have opposite signs, then there is at least one value of c between a and b for which f(c) = 0; f(x) = 0 has at least one real root c between a and b.

Example: Show that $f(x) = x^3 - 2x - 5$ has a real zero between 2 and 3.

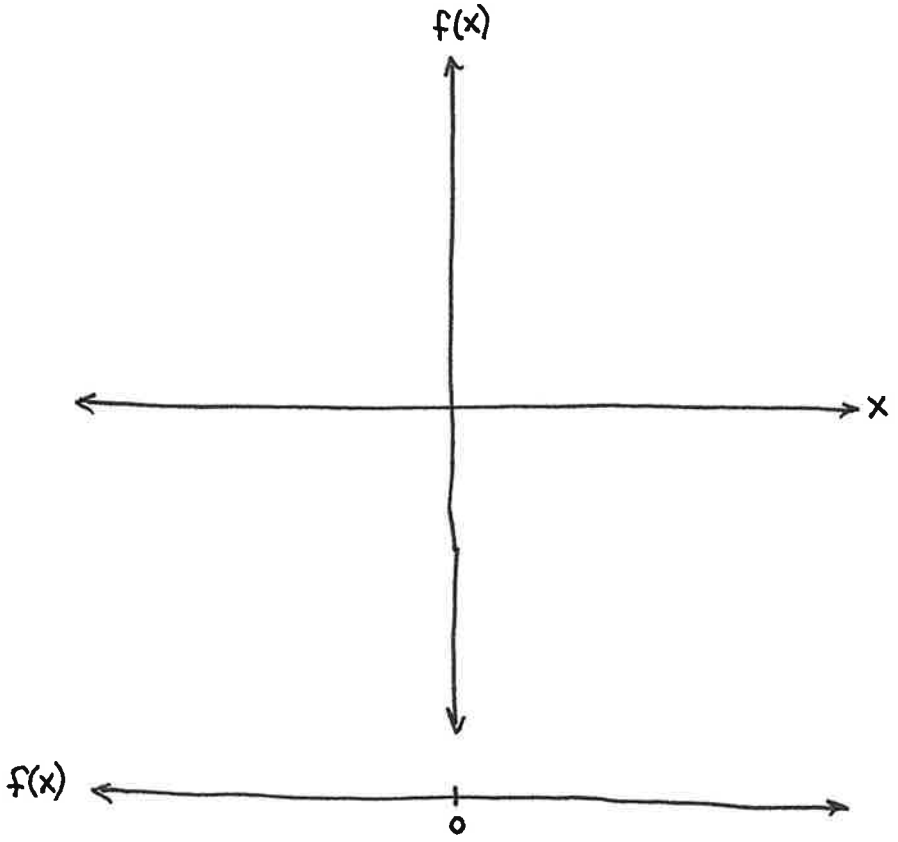
Graph $f(x) = -2(x - 1)^2(x + 2)$.

end behavior

x-intercepts

y-intercept

number line



Graph $f(x) = 2(x + 2)^2(X - 3)$.

end behavior

x-intercepts

y-intercept

number line