9/20

Wednesday, September 20, 2017 8:23 AM

Exam 1 on Monday, 9/25

↳ Chapter 2 & section 3.2

Exam 1 review on Saturday, 9/23, 10am-noon in MMC CP 145.

A professor will mostly answer student's questions

Online review available on mathstat.fiu.edu. look for the link on the second page in syllabus.

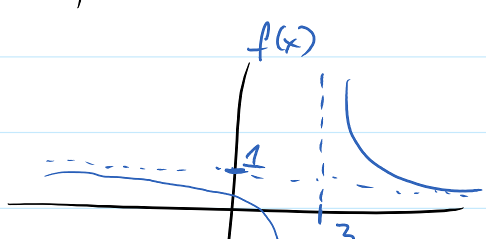
Section 2.7

Note: A function, $f(x)$, is one-to-one if it has a inverse.

Ex: find f^{-1}, if $f(x) = \frac{x+2}{x-3}$, $x \neq 3$.

$$y = \frac{x+2}{x-3} \leftrightarrow x = \frac{y+2}{y-3}$$

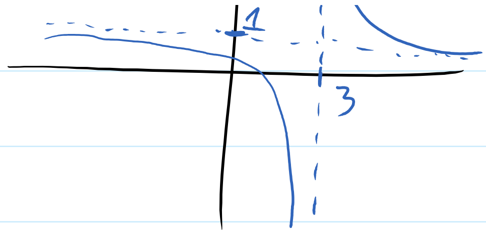
	f	f^{-1}
domain	$(-\infty,3)\cup(3,\infty)$	$(-\infty,1)\cup(1,\infty)$
range	$(-\infty,1)\cup(1,\infty)$	$(-\infty,3)\cup(3,\infty)$



$$x(y-3) = y+2$$

$$xy - 3x = y + 2$$

$$xy - 3x = y + 2$$
$$xy - y = 3x + 2$$
$$y(x-1) = 3x + 2$$



$$y = \frac{3x+2}{x-1}$$

$$f^{-1}(x) = \frac{3x+2}{x-1}$$

Domain: $(-\infty, 1) \cup (1, \infty)$

f is one-to-one.

Section 3.2 - Polynomials

		degree	leading coef.
$x - 3$	✓	1	1
$x^4 + x - 2$	✓	4	1
$x^2 + x^{-2}$	✗	✗	✗
$-3x^4 - \frac{1}{x} = -3x^4 - x^{-1}$	✗	✗	✗
$-x^2 + x^0 = -x^2 + 1$	✓	2	-1

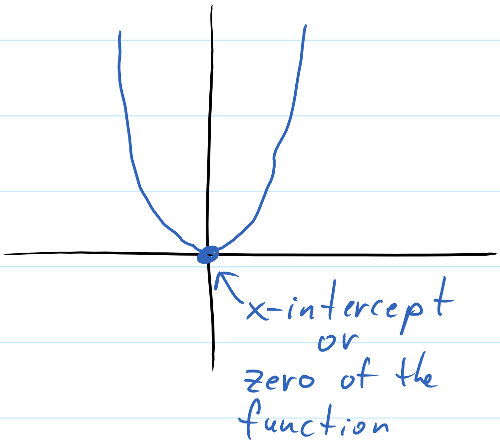
Def: Let n be a nonnegative integer and let $a_n, a_{n-1}, \ldots, a_1, a_0$ be real numbers, with $a_n \neq 0$. The function defined by

$$a_n x^n + a_{n-1} x^{n-1} + \cdots + a_1 x + a_0$$

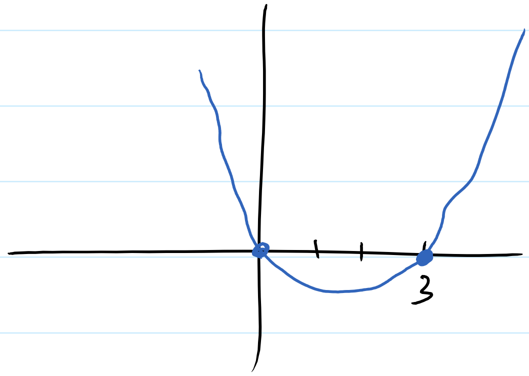
is called a polynomial function of degree n. The number a_n, is called the leading coefficient.

Graphing a polynomial function

$f(x) = x^2$



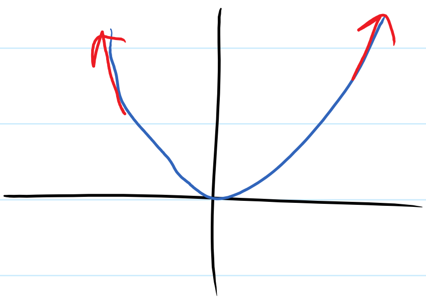
$f(x) = x^2 - 3x = x(x-3)$



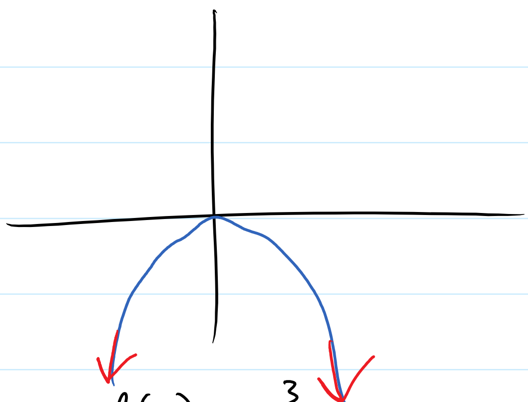
$f(x) = x^3 + 2x^2 - x + 3$

$f(x) = x(x-3)^4(x-1)^2$

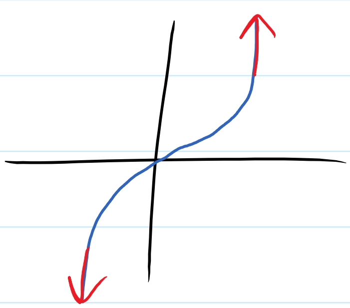
$f(x) = x^2$



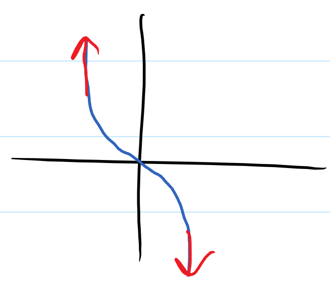
$f(x) = -x^2$



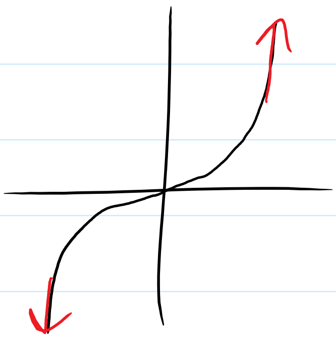
$f(x) = x^3$



$f(x) = -x^3$



$f(x) = x^{7} \leftrightarrow$ looks like x^3



leading coefficient test

As x increases or decreases without bound, the graph of the polynomial will have the following end behavior:

sign of the leading coefficient	degree: odd	degree: even
+	↙ ↗	↖ ↗
−	↖ ↘	↙ ↘

Ex: use the leading Coeff test to determine the end behavior of:

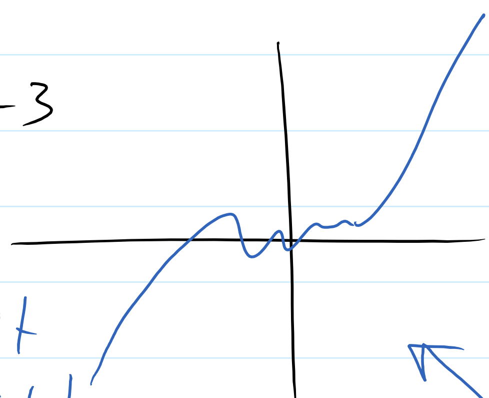
$$f(x) = x^3 + 3x^2 - x - 3$$

leading coeff: 1

degree : 3

The function falls on left

rises on right



$f(x) = x^3 + 2x^2 - x + 3$

$$\left.\begin{aligned} f(x) &= x(x-3)^4(x-1)^2 = x \cdot x^4 \cdot x^2 + \dots \\ &= x^7 + \dots \end{aligned}\right\} \text{ end behavior as}$$

<u>Ex:</u> $f(x) = -4x^3(2x-1)^2(x+5) = -4x^3 \cdot (2x)^2 \cdot x + \dots$

$$= -4x^3 \cdot 4x^2 \cdot x + \dots$$

$$= -16x^6 + \dots$$

$$\left.\begin{aligned} \text{leading coeff: } & -16 \\ \text{degree: } & 6 \end{aligned}\right\} \quad \swarrow \quad \searrow$$

Zeros of Polynomial Functions

<u>Ex:</u> Find all zeros of: $f(x) = x^3 + 3x^2 - x - 3$

$$= x^2(x+3) - 1(x+3)$$

$$= (x+3)(x^2-1)$$

$$= (x+3)(x-1)(x+1)$$

$x+3=0$	$x-1=0$	$x+1=0$
$\boxed{x=-3}$	$\boxed{x=1}$	$\boxed{x=-1}$

<u>Ex:</u> Find all zeros: $f(x) = -x^4 + 4x^3 - 4x^2 = 0$

$$x^2(-x^2 + 4x - 4) = 0$$

$$-x^2(x^2 - 4x + 4) = 0$$

$$-x^2(x-2)^2 = 0$$

$-x^2 = 0$ | $x-2=0$ $\rightarrow$ $x \cdot x(x-2)(x-2)=0$

$$-x^2(x-2)=0 \rightarrow -x\cdot x(x-2)(x-2)=0$$

$$-x^2=0 \qquad \boxed{x=0}$$

$$x-2=0 \qquad \boxed{x=2}$$

because 0 and 2 are zeros twice, we say that a zero of a polynomial has its multiplicity.

zero	multiplicity
0	2
2	2