

2.3 Polynomial Functions

Ex: What is the degree of:

$$y = -89x^6 + 3x^5 + 2x^3 - 7x + 2$$

(6)

$$y = (x-5)^2 (x+2)^3$$

(5)

$$y = x^2 (2x-3)^1 (x+5)^3 (x+1)^2$$

(8)

$$y = 4(x+1)^1 (x-1)^1$$

(2)

END BEHAVIOR: determined by the degree and the sign(+/-) of L.C.

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

left

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

right

ODD DEGREE

+ L.C.

$$\begin{aligned} \lim_{x \rightarrow -\infty} f(x) &= -\infty \\ \lim_{x \rightarrow \infty} f(x) &= \infty \end{aligned}$$

- L.C.

$$\begin{aligned} \lim_{x \rightarrow -\infty} f(x) &= \infty \\ \lim_{x \rightarrow \infty} f(x) &= -\infty \end{aligned}$$

EVEN DEGREE

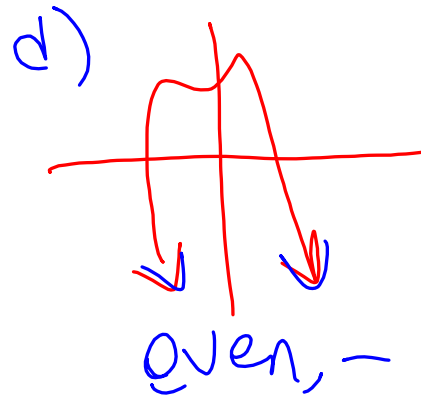
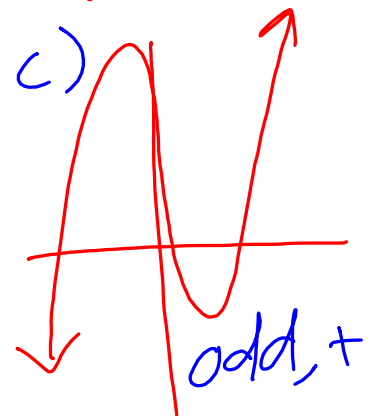
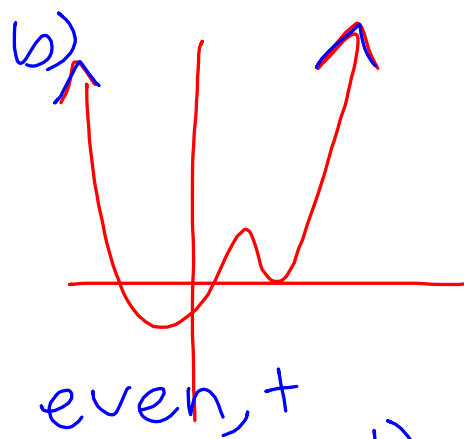
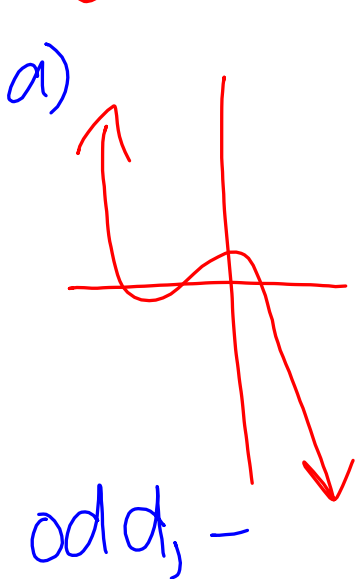
+ L.C.

$$\begin{aligned} \lim_{x \rightarrow -\infty} f(x) &= \infty \\ \lim_{x \rightarrow \infty} f(x) &= \infty \end{aligned}$$

- L.C.

$$\begin{aligned} \lim_{x \rightarrow -\infty} f(x) &= -\infty \\ \lim_{x \rightarrow \infty} f(x) &= -\infty \end{aligned}$$

Ex: Name the degree and sign of L.C.



Ex. Write the end behavior:

a.) $f(x) = x^3 + 2x^2 - 11x - 12$

Deg: 3, +

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

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

Zeros (roots) and Multiplicity

Zeros: where a graph crosses x-axis
when $y=0$

* Can be found from factors

$$(x-a)=0$$

$$\underline{x=a}$$

Ex: Find the zeros of:

$$y = 3x^5 - 5x^4 + 2x$$

$$x = 0, 1, 1.4$$


Given the zeros, write an eqn of the function


a) deg 3, $x = 0, 2, -5$
 $x=0$ $x=2$ $x=-5$
 $-2 = -2$ $+5 = +5$

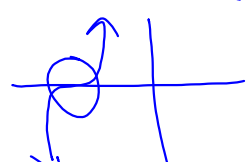
$$f(x) = x'(x-2)'(x+5)'$$

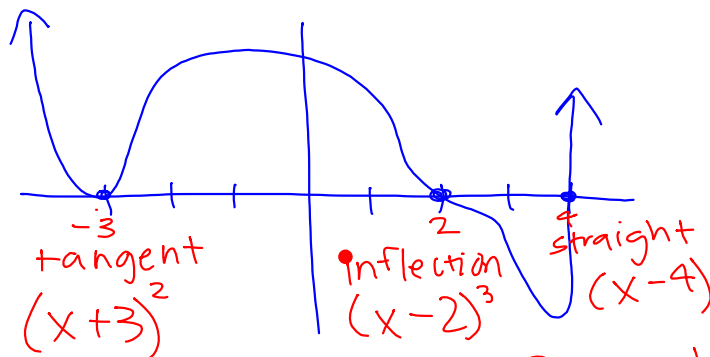
Multiplicity

The power of the factor.

• Straight intersection
 $(x-a)'$ 

• Tangent intersection "bounce"
 $(x-a)^{\text{even}}$ 

• Inflection intersection "slide through"
 $(x-a)^{\text{odd}}$ 



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