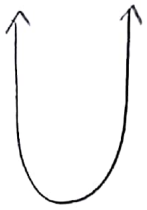
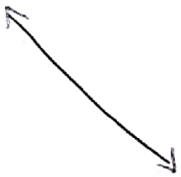
Section 2.3

GRAPHS OF POLYNOMIAL FUNCTIONS

Make a chart:

Degree	1 linear x^1	2 quadratic x^2	3 cubic x^3	4 quartic x^4	5 quintic x^5
# of "turns"	0	1	2	3	4
Positive Leading Coefficient					
Negative Leading Coefficient					

Conclusions:

# of Turns: one less than the degree

ODD DEGREE

opposite end behavior:
one arm is up.
one is down

EVEN DEGREE

same end behavior:
arms are going
the same direction

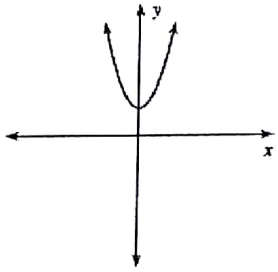
	Positive L.C.	Negative L.C.
Odd Degree	As $x \to -\infty$ $f(x) \to$ $-\infty$ ($\lim_{x \to -\infty} f(x) \to -\infty$) As $x \to +\infty$ $f(x) \to$ ∞ ($\lim_{x \to \infty} f(x) \to \infty$)	As $x \to -\infty$ $f(x) \to$ ∞ ($\lim_{x \to -\infty} f(x) \to \infty$) As $x \to +\infty$ $f(x) \to$ $-\infty$ ($\lim_{x \to \infty} f(x) \to -\infty$)
Even Degree	As $x \to -\infty$ $f(x) \to$ ∞ ($\lim_{x \to -\infty} f(x) \to \infty$) As $x \to +\infty$ $f(x) \to$ ∞ ($\lim_{x \to \infty} f(x) \to \infty$)	As $x \to -\infty$ $f(x) \to$ $-\infty$ ($\lim_{x \to -\infty} f(x) \to -\infty$) As $x \to +\infty$ $f(x) \to$ $-\infty$ ($\lim_{x \to \infty} f(x) \to -\infty$)

per. 1

Describe the end behavior and the number of turns for each graph below:

Ex 1:

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

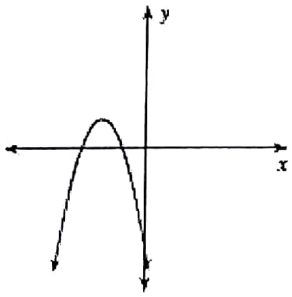


$\lim_{x \to -\infty} f(x) = \infty$

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

Ex 2:

$f(x) = -x^2 - 6x - 7$

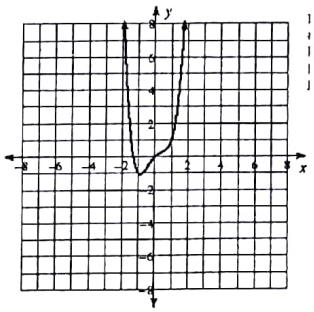


$\lim_{x \to -\infty} f(x) = -\infty$

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

Ex 3:

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

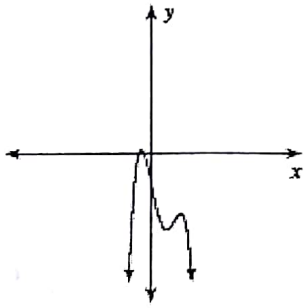


$\lim_{x \to -\infty} f(x) = \infty$

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

Ex 4:

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

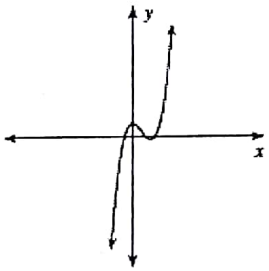


$\lim_{x \to -\infty} f(x) = -\infty$

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

Ex 5:

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

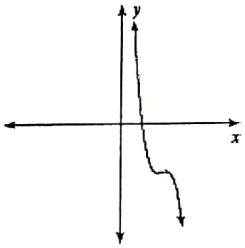


$\lim_{x \to -\infty} f(x) = -\infty$

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

Ex 6:

$f(x) = -x^3 + 10x^2 - 33x + 32$

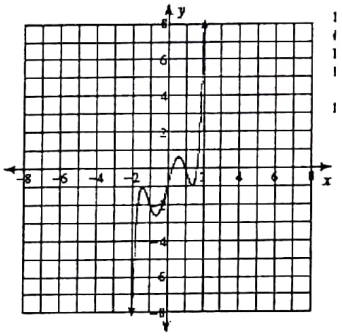


$\lim_{x \to -\infty} (f(x)) = \infty$

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

Ex 6:

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

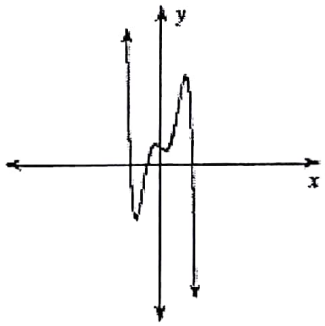


$\lim_{x \to -\infty} f(x) = -\infty$

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

Ex 8

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



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

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

What can you generalize about the end behavior and its function?

What can you generalize about the number of turns and its function?

Sketching a Graph of Polynomials

The following information is needed for sketching a graph of any polynomials:

Odd or even degree
End behavior
How many turns (degree – 1)

Ex 9: $f(x) = -x^2 - 6x - 7$

even degree
$\lim_{x \to -\infty} f(x) = -\infty$
$\lim_{x \to \infty} f(x) = -\infty$
1 turn

Ex 10: $f(x) = x^3 - 2x^2 + 1$

odd degree
$\lim_{x \to -\infty} f(x) = -\infty$ $\lim_{x \to \infty} f(x) = \infty$
2 turns

Ex 11: $f(x) = -x^5 + 4x^3 - x + 1$

odd degree
$\lim_{x \to -\infty} f(x) = \infty$ $\lim_{x \to \infty} f(x) = -\infty$
4 turns

Ex 12: $f(x) = x^4 - 3x^3 - 2 - 5x$

Even degree $\lim_{x \to -\infty} f(x) = \infty$ $\lim_{x \to \infty} f(x) = \infty$
3 turns

Ex 13: $f(x) = x^4 + 8x^3 + 4x^2 + 2$

Even degree 3turns
$\lim_{x \to -\infty} f(x) = \infty$ $\lim_{x \to \infty} f(x) = \infty$

Ex 14: $f(x) = x^3 + 3x^2 - x - 3$

odd degree 2 turns
$\lim_{x \to -\infty} f(x) = -\infty$ $\lim_{x \to \infty} f(x) = \infty$

Ex 15: $f(x) = x^2 - 8x + 2$

Even degree 1turn
$\lim_{x \to -\infty} f(x) = \infty$ $\lim_{x \to \infty} f(x) = \infty$

$x \to \infty$ 2 turns

factored form.

16) $f(x) = (x-3)(5-x)(2x-7)$

$x-3=0$ $\quad 5-x=0$ $\quad 2x-7=0$

$x=3$ $\quad x=5$ $\quad x=\frac{7}{2}$

$(3,0)$ $\quad (5,0)$ $\quad (3.5,0)$

Sketch By hand (include x-int(s))

Describe end behavior

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

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

leading term: $(x)(-x)(2x)$

$\rightarrow -2x^3$

$(-3)(5)(-7)$

$(0, 105)$