

5-1: POLYNOMIAL FUNCTIONS

Algebra 2
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POLYNOMIAL FUNCTIONS

◉ Monomials

- A real number, a variable or the product of a real number and one or more variables with whole number exponents.

$$3$$

$$3x$$

$$x^2$$

◉ Polynomial

- A monomial or a sum of monomials

$$x + 4$$

$$(x^2 + 4y)^3$$

$$x^5 + 2x^3 - 3$$

- A polynomial with the variable x defines the polynomial function of x .

DEGREES OF POLYNOMIALS

- ◉ Degree of a Monomial (in one variable)
 - Exponent of the variable
 - $3x$ - degree 1
 - x^2 - degree 2
- ◉ Degree of a Polynomial (in one variable)
 - The greatest degree among the monomial terms.
 - $x + 4$ - degree 1
 - $x^5 + 2x^3 - 3$ - degree 5

STANDARD FORM OF A POLYNOMIAL FUNCTION

- ◉ Arranges terms by degree in descending numerical order

A polynomial function $P(x)$ in standard form is:

$$P(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$$

where n is a nonnegative integer and a_n, \dots, a_0 are real numbers.

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

Cubic Term Quadratic Term Linear Term Constant Term

CLASSIFYING POLYNOMIALS BY DEGREE

Degree	Name Using Degree	Polynomial Example	Number of Terms	Name Using Number of Terms
0	Constant	5	1	Monomial
1	Linear	$x + 4$	2	Binomial
2	Quadratic	$4x^2$	1	Monomial
3	Cubic	$4x^3 - 2x^2 + x$	3	Trinomial
4	Quartic	$2x^4 + 5x^2$	2	Binomial
5	Quintic	$-x^5 + 4x^2 + 2x + 1$	4	Polynomial of 4 Terms

Write each polynomial in standard form. What is the classification of each by degree? By number of terms?

$$3x^3 - x + 5x^4$$

Standard Form: $5x^4 + 3x^3 - x$

Classification (degree): **Quartic**

Classification (terms): **Trinomial**

$$3 - 4x^5 + 2x^2 + 10$$

Standard Form: $-4x^5 + 2x^2 + 13$

Classification (degree): **Quintic**

Classification (terms): **Trinomial**

$$-3x + 4x^3 + 7x - 3$$

Standard Form: $4x^3 + 4x - 3$

Classification (degree): **Cubic**

Classification (terms): **Trinomial**

HOMEWORK: p. 285 #8-19

END BEHAVIOR AND TURNING POINTS

	n is even (n≠0)	n is odd (n≠0)
a > 0	Rises to the left, rises to the right	Falls to the left, rises to the right
a < 0	Falls to the left, Falls to the right	Rises to the left, falls to the right

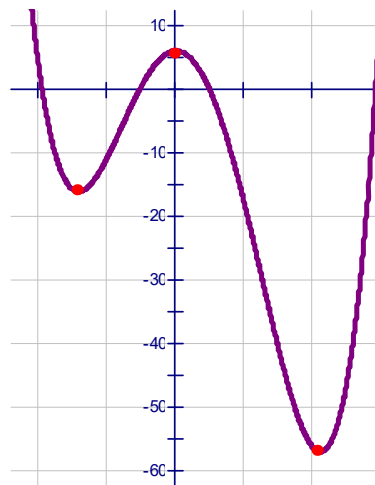
$$p(x) = 4x^4 - 4x^3 - 24x^2 + x + 6$$

End Behavior: Rises to the left,
rises to the right

Turning Points:
(-1.41, -16.1) (.02, 6.01)
(2.14, -57.08)

Decreasing Interval:
 $(-\infty, -1.41) \cup (.02, 2.14)$

Increasing Interval:
 $(-1.41, .02) \cup (2.14, \infty)$



END BEHAVIOR AND TURNING POINTS

$$y = -4x^3 + 2x^2 + 7$$

End Behavior: Rises to the left,
Falls to the right

Turning Points:

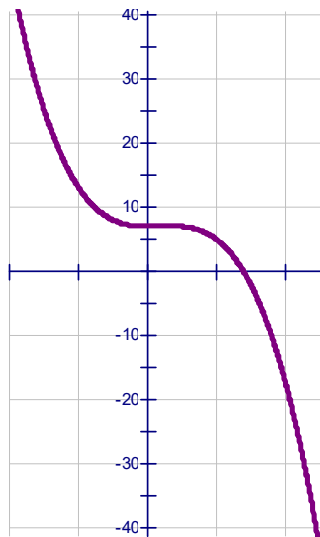
There are no turning points.

Decreasing Interval:

$$(-\infty, \infty)$$

Increasing Interval:

The function only decreases.

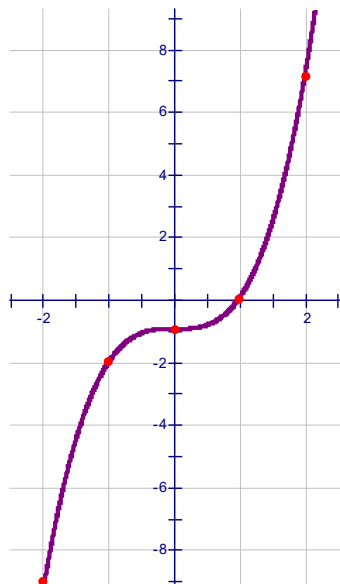


GRAPHING CUBIC FUNCTIONS

$$y = x^3 - 1$$

1. Make a table of values.
2. Plot points.

x	y
-2	-9
-1	-2
0	-1
1	0
2	7

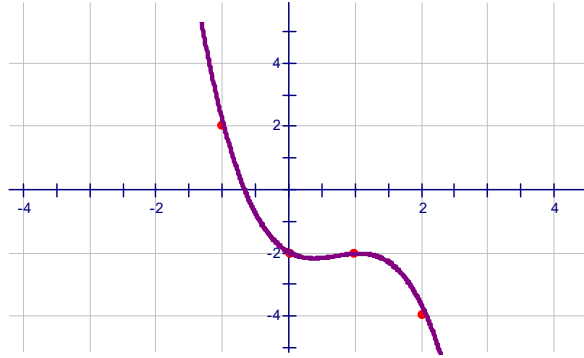


GRAPHING CUBIC FUNCTIONS

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

1. Make a table of values.
2. Plot points.

x	y
-2	16
-1	2
0	-2
1	-2
2	-4



HOMEWORK: p. 285 #20-37