5.1 - Polynomial Functions

Note Title

Graph the following functions on the graphing calculator and observe differences between polynomial & nonpolynomial functions.

Polynomial Functions	Nonpolynomial Functions
$f(x) = x^2 + 3x + 5$ $f(x) = 4$ $f(x) = -0.5x^4 + 5x - 2.3$	$f(x) = \lvert x - 4 \rvert$ $f(x) = 1 + \sqrt{2x - 5}$ $f(x) = \dfrac{x - 7}{2x}$

Polynomial Definitions

A number or variable raised to a power or a product of numbers and variables raised to powers is a _____.
(These are seperated by _____ and _____.)

A _____ is one or more terms combined with addition & subtraction. The powers must all be _____ _____. ( )

The _____ of a term is the sum of the _____.

The _____ of a polynomial is the degree of the _____ _____ in the polynomial.

Ex:

The _____ of a term is the constant or number of the term.

A _____ is a polynomial with one term.

A _____ is a polynomial with two terms.

A _____ is a polynomial with three terms.

The _____ _____ of a polynomial is the term of highest degree. Its coefficient is the _____ _____.

A polynomial with one variable is called

_____ if it has degree 0 or 1.

_____ if it has degree 2.

_____ if it has degree 3.

_____ _____ is when the exponents of one variable _____ from left to right in the polynomial.

_____ _____ is when the exponents of one variable _____ from left to right in the polynomial.

Finally, some examples!

(1) For each polynomial, find the degree of each term, the degree of the polynomial, the leading term, and the leading coefficient.

a) $3x^4 - 17x^2 + 2x - 5$

Term:

Degree:

Leading term:
Leading coeff.:
Degree of Poly:

b) $3x^3 - 5x^2y^3 - 8x^4y^2 + 4y^4 + 4x - 7$

Leading term:
Leading coeff.:
Degree of Poly:

(2) Arrange the polynomial in both ascending & descending order.

$3x - 10x^4 + 8 - 3x^2 - 4x^3$

ascending:
descending:

A _____ _____ has the form

$P(x) = a_n x^n + a_{n-1} x^{n-1} + \dots a_1 x + a_0$ where a_i are constants and n is a whole number

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

(Look at evaluate, table, and graph on graphing calculator)

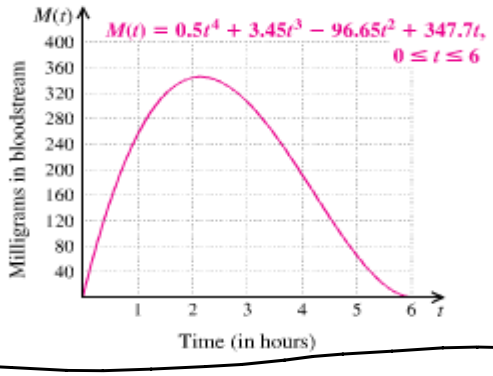
EXAMPLE 4 Medicine. Ibuprofen is a medication used to relieve pain. The polynomial function

$$M(t) = 0.5t^4 + 3.45t^3 - 96.65t^2 + 347.7t, \quad 0 \le t \le 6$$

can be used to estimate the number of milligrams of ibuprofen in the bloodstream t hours after 400 mg of the medication has been swallowed (*Source*: Based on data from Dr. P. Carey, Burlington, VT).

a) How many milligrams of ibuprofen are in the bloodstream 2 hr after 400 mg has been swallowed?

b) Use the graph below to estimate $M(4)$.



The domain of any polynomial function is _____.

(5) Find the range of the function using the graphing calculator.

a) $f(x) = x^3 - 3x^2 + 6$

b) $g(x) = x^4 - 4x^2 + 5$

To add or subtract polynomials, we can only combine _____.

Defn:

(6) Combine like terms

a) $3t^2 - 4t - 4t^2 - 3t + 8$

b) $5x^2y - 6xy^2 + 2x^2y^2 + 9xy^2 - 9x^2y$

(7) Add or subtract the polynomials.

a) $(2x^3 - 4x^2 + 5) + (3x^3 - 5x - 3)$

b) $(4s^3 - 7s^2 + 3s + 8) + (-3s^3 - 2s^2 - 5s + 2)$

c) $(4x^2y - 7xy + 3y) + (x^2y - 2xy - 7y)$

d) $(3t^2 - 4t - 8) - (t^2 + 2t - 5)$

e) $(-4r^3 + 3r - 7) - (3r^2 - 5r + 4)$

f) $(4x^2y - 7xy + 3y) - (x^2y - 2xy - 7y)$