

## 6.1 Polynomial Functions

A polynomial is a monomial or the sum of monomials.

To write a polynomial in standard form always go from the highest degree or exponent to the lowest degree or constant if there is one.

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

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

leading coefficient = 2

degree = 3

(degree = highest exponent)

# of terms: 4  
name by degree: cubic

name by # of terms:

polynomial

ex 1

Classify by degree & # of terms (put in standard form first.)

a)  $4x - 6x + 5 = -2x + 5$

degree 1: linear terms (2): binomial

b)  $3x^3 - x^2 - 4x + 2x^3 = 5x^3 - x^2 - 4x$

degree 3: cubic terms (3): trinomial

c)  $6 - 2x^5 = -2x^5 + 6$

degree 5: quintic terms (2) = binomial

Degree	Name Using Degree	Polynomial Example	# of terms	Name using # of terms
0	constant	6	1	monomial
1	linear	$x + 3$	2	binomial
2	quadratic	$3x^2$	1	monomial
3	cubic	$2x^3 - 5x^2 - 2x$	3	trinomial
4	quartic	$x^4 + 3x^2$	2	binomial
5	quintic	$-2x^5 + 3x^2 - x + 4$	4	polynomial of 4 terms

Simplify. Classify the results by the # of terms.

①  $(2c^2 + 9) + (3c^2 + 7) = 5c^2 + 16$  (Binomial)

only add the #'s in front of "LIKE" variable terms

↑ 2 terms

(DO NOT Add exponents when adding or subtracting like terms)

②  $(7x^3 + 9x^2 - 8x + 11) - (5x^3 - 13x - 16)$

$7x^3 + 9x^2 - 8x + 11 - 5x^3 + 13x + 16$

$2x^3 + 9x^2 + 5x + 27$  polynomial like terms

★ For subtraction problems: distribute the minus sign 1st then combine like terms



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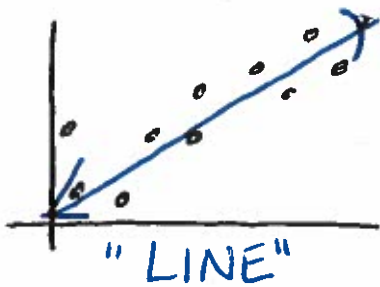
$$\begin{aligned}
(3) \quad & c(c-3)^2 \\
& c(c-3)(c-3) \\
& (c^2-3c)(c-3) \\
& c^3 - 3c^2 - 3c^2 + 9c \\
& \boxed{c^3 - 6c^2 + 9c} \\
& \text{trinomial}
\end{aligned}$$

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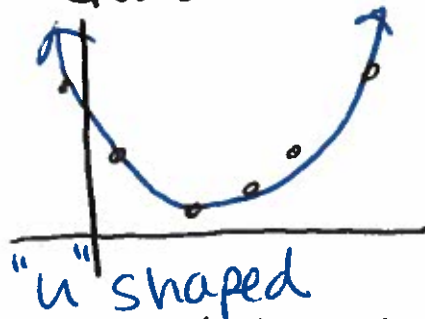
$$\begin{aligned}
(4) \quad & (2c-3)(2c+4)(2c-1) \\
& 4c^2 + 8c - 6c - 12 \downarrow \\
& (4c^2 + 2c - 12)(2c-1) \\
& 8c^3 + 4c^2 - 24c - 4c^2 - 2c + 12 \\
& \boxed{8c^3 - 26c + 12} \\
& \text{trinomial}
\end{aligned}$$

Finding the cubic model.

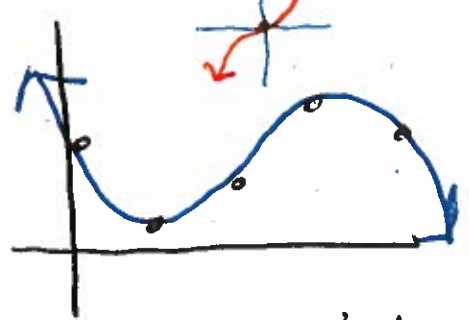
Linear Model



Quadratic



Cubic



Use the graphing calculator to determine which model best fits the values in the table.

X	0	5	10	15	20
Y	10.1	2.8	8.1	16.0	17.8

`Stat` `edit`

enter x's in L1  
y's in L2

Linear Regression:  $r^2 = .55$

Quadratic Regression:  $r^2 = .76$

Cubic Regression:  $r^2 = .9998$

you want the  $r^2$  value to be close to 1

To turn on the Diagnostics, `2nd` `0` `X-1`  
go down to DiagnosticOn and hit `enter` twice

To put the regression equation in the  $\boxed{y=}$ , 1st make sure you just did the regression you wanted, then go to the  $\boxed{y=}$  button,  $\boxed{\text{Vars}} \downarrow 5: \text{statistics} \rightarrow \text{EQ}$   
 1. RegEQ hit  $\boxed{\text{ENTER}}$

★ like # 21 + 23 on HW

(ex) Find the cubiz model. (cubic reg) Findy when  $x=17$   
 $(-2, -7) (-1, 0) (0, 1) (1, 2) (2, 9)$

$L_1(X)$	$L_2(y)$
-2	-7
-1	0
0	1
1	2
2	9

$y = ax^3 + bx^2 + cx + d$   
 $a = 1$   
 $b = 0$   
 $c = 0$   
 $d = 1$   
 $y = 1x^3 + 0x^2 + 0x + 1$   
 $\boxed{y = 1x^3 + 1}$   
 Cubic model

$y = 1(17)^3 + 1$   
 $y = 4914$

(ex) p. 309 #17

	$L_1$	$L_2$ males	$L_3$ females
$x=0$	1970	67.1	74.7
10	1980	70.0	77.4
20	1990	71.8	78.8
30	2000	74.3	79.7
40	2010	74.5	81.3

(M) quadreg  $L_1, L_2$   $r^2 = .987$   
 (F) quadreg  $L_1, L_3$   $r^2 = .983$   
 (M) cubic  $L_1, L_2$   $r^2 = .999$   
 (F) cubic  $L_1, L_3$   $r^2 = .9999$

$y = -.0001x^3 + .00264x^2 + .239x + 67.169$

$-1E-4$   
 $-1 \times 10^{-4} = .0001$

6.1 p. 4