Unit 2 - Polynomials

$x^0 = 1$

Polynomial Functions

$y = c$ 0

Consider the familiar functions: order/degree

linear: $y = ax + b(x^0)$ 1

quadratic: $y = ax^2 + bx + c$ 2

We can continue this pattern:

cubic: $y = ax^3 + bx^2 + cx + d$ 3

quartic: $y = ax^4 + bx^3 + cx^2 + dx + e$ 4

quintic: $y = ax^5 + bx^4 + cx^3 + dx^2 + ex + f$ 5

In general, a polynomial function in standard form is:

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

where $\{a_0, a_1, \ldots, a_n \in \mathbb{R}\}$ and $\{n \in \mathbb{W}\}$

Sep 11-10:08 PM

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

notes:

(1) a_n is the leading coefficient $a_n \neq 0$

(2) the degree of a polynomial is the value of the highest exponent

(3) a polynomial in standard form has descending powers of x

Recall:

first differences are constant for a LINEAR RELATION

second differences are constant for a QUADRATIC

Higher-order finite differences can be used to identify other polynomials from data points.

For an order-N polynomial, the Nth difference will be constant.

Domain is always $\{x \in \mathbb{R}\}$

Range varies according to graph (parent + transformations).

Sep 16-8:34 PM

Finite Differences

$$y = ax + b$$

x	y	Δy
0	b	
1	$a+b$	a
2	$2a+b$	a
3	$3a+b$	a
4	$4a+b$	a
5	$5a+b$	a

$$y = ax^2 + bx + c$$

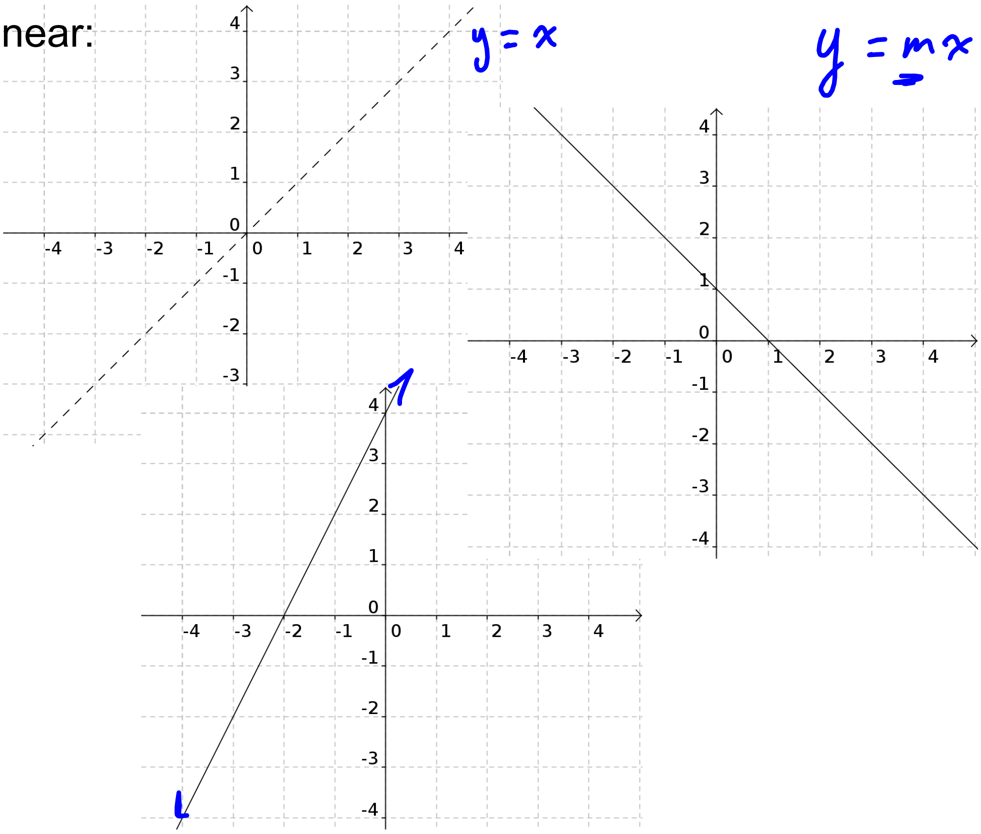
x	y	Δy	$\Delta^2 y$
0	c		
1	$a+b+c$	$a+b$	
2	$4a+2b+c$	$3a+b$	$2a$
3	$9a+3b+c$	$5a+b$	$2a$
4	$16a+4b+c$	$7a+b$	$2a$
5	$25a+5b+c$	$9a+b$	$2a$

Sep 16-8:43 PM

Linear:

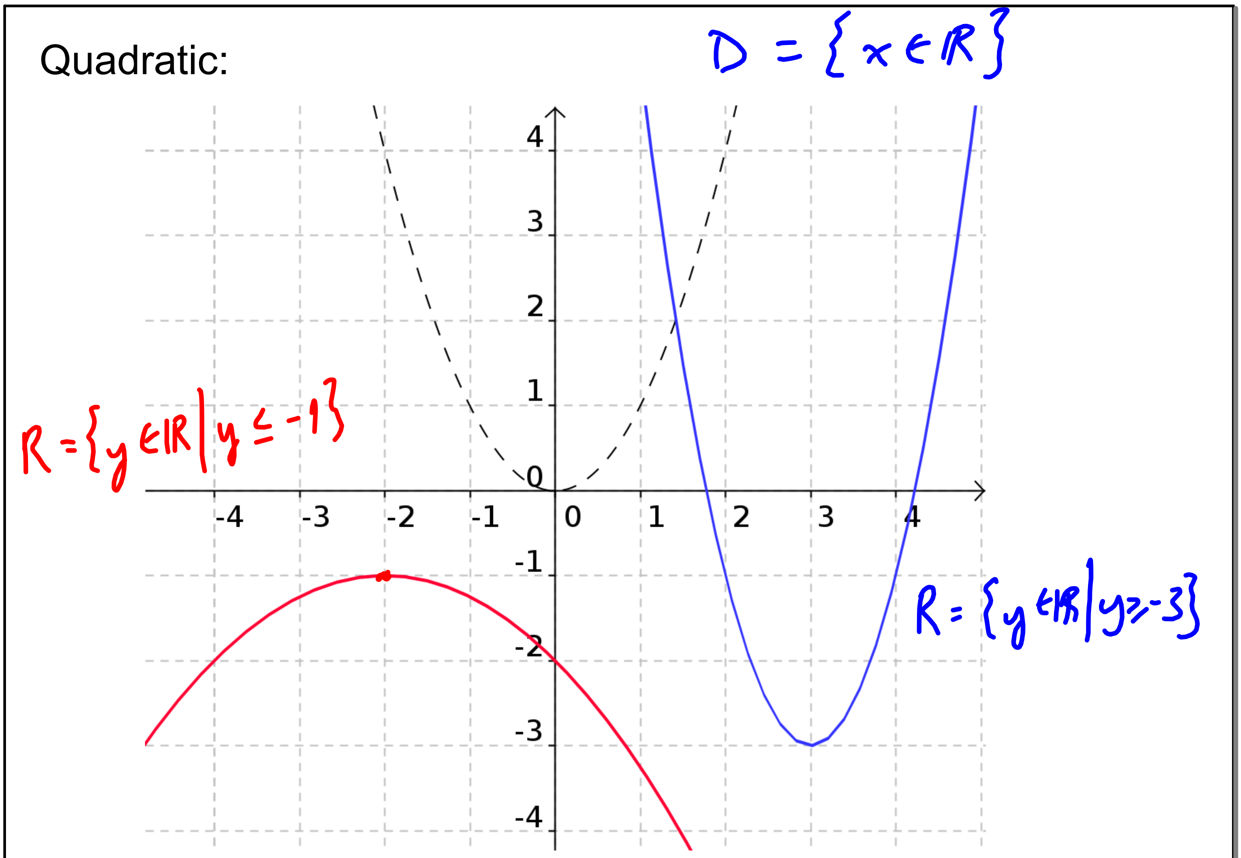
$y = x$

$y = mx + b$



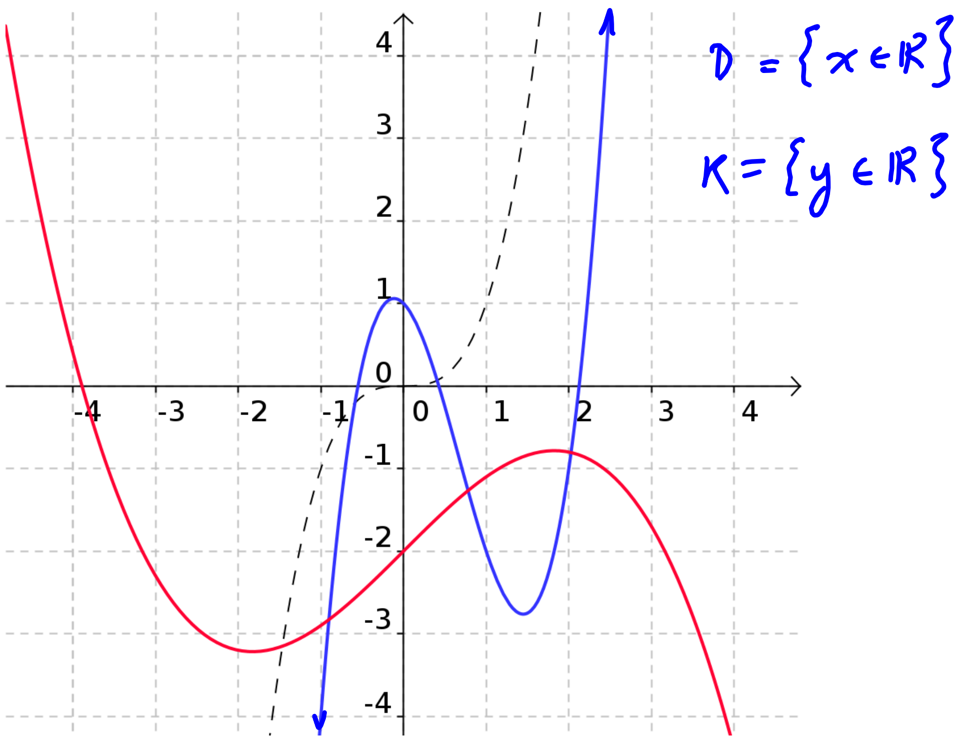
Sep 16-9:10 PM

Quadratic:



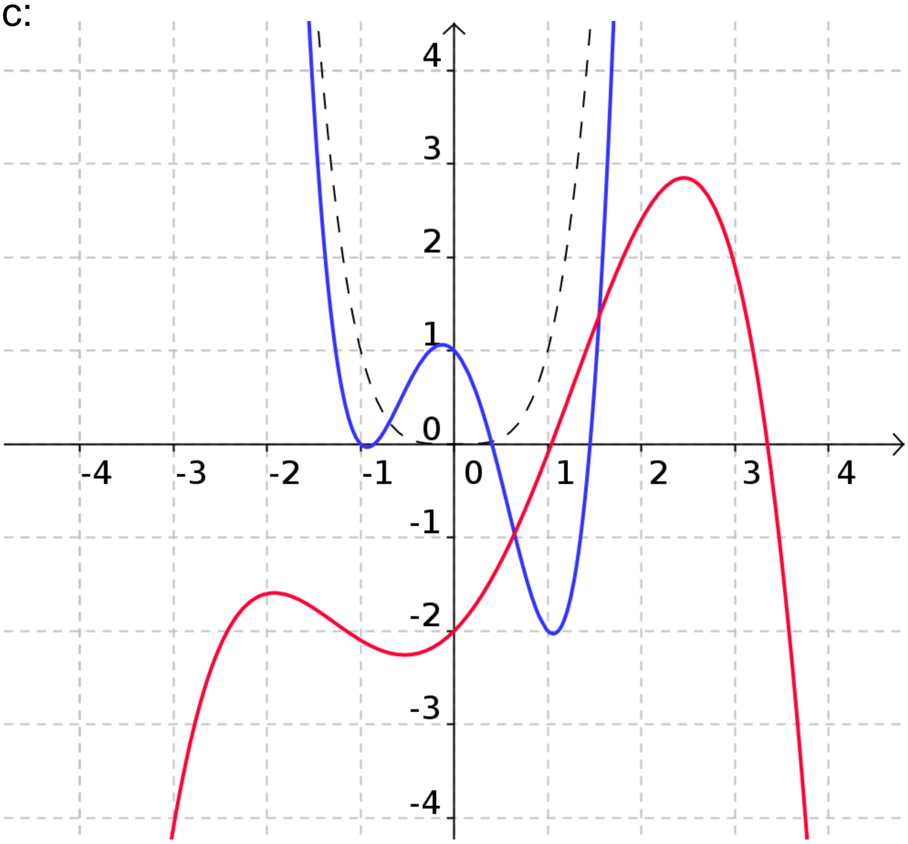
Sep 16-9:13 PM

Cubic:



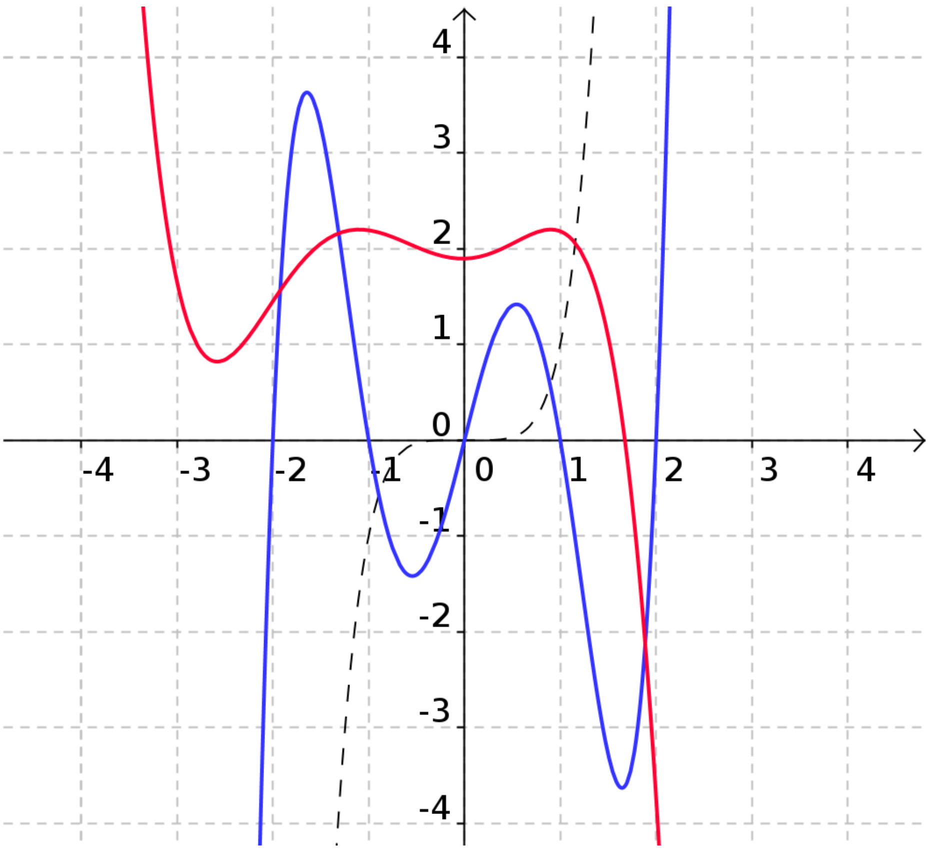
Sep 16-9:20 PM

Quartic:



Sep 16-9:21 PM

Quintic:



Sep 16-9:26 PM

Assigned Work:

p.127 # 1 - 5

Sep 9-9:41 PM