

Chapter 2

POLYNOMIAL FUNCTIONS

Polynomial Function

- A function given by:

$$f(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_2 x^2 + a_1 x^1 + a_0$$

Example:

$$f(x) = x^5 + 5x^4 - 3x^3 + 7x^2 - 10x + 8$$

DEGREE

- The highest exponent value of a function
- Examples:
 - 1.) $f(x) = 3x^2 - 7x + 18$
 - 2.) $f(x) = x^5 + 5x^4 - 3x^3 + 7x^2 - 10x + 8$
 - 3.) $g(x) = 3x + 5x^6 - 3x^2 + 7$
 - 4.) $h(x) = 6x - 6$
 - 5.) $j(x) = 5$

Quadratic Function

- A function given by: $f(x) = ax^2 + bx + c$, where a , b , and c are real numbers and $a \neq 0$
- Graph is called a parabola
- Graph is symmetric with respect to the axis of symmetry
- Vertex- point where the graph intersects the axis of symmetry
- Show graph on board

Quadratic Functions

- If “ a ” is positive, the parabola opens up (vertex is a minimum)
- If “ a ” is negative, the parabola opens down (vertex is a maximum)

Standard Form: $f(x) = ax^2 + bx + c$

To find the Vertex:

- 1.) x value of vertex is
 $x = -b/2a$
- 2.) Plug in x-value in
function to find y
- 3.) Vertex is:
 $(-b/2a, f(-b/2a))$

To Find the x-intercepts:

- 1.) Set function = 0
- 2.) Solve for x:
 - factor
 - set = 0 and solve
 - quadratic formula

Examples- Graph

1.) $y = x^2 - 6x + 8$

2.) $f(x) = -x^2 - 4x + 21$

Examples- Graph

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

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

Examples- Graph

$$\begin{aligned}a &= 1 \\b &= 2 \\c &= 3\end{aligned}$$

$$5.) f(x) = x^2 - 7$$

$$x = \frac{-b}{2a} = -1$$

$$y = (-1)^2 + 2(-1) + 3$$

$$y = 1 - 2 + 3$$

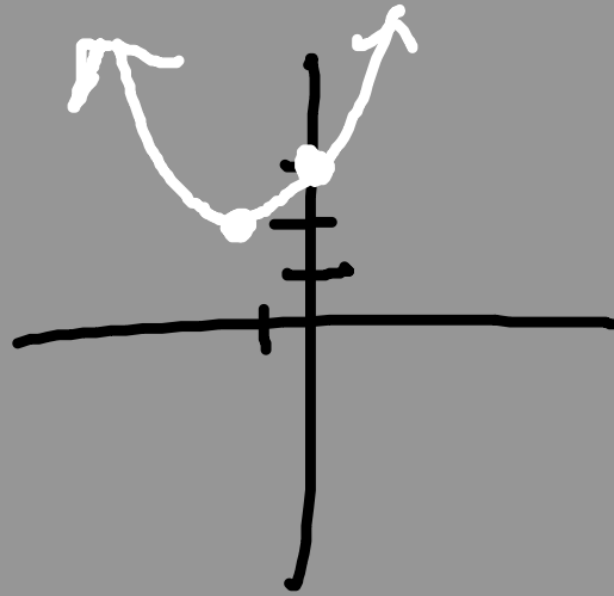
$$y = 2$$

$$V(-1, 2)$$

$$y\text{-int} \\ (0, 3)$$

$$6.) f(x) = x^2 + 2x + 3$$

$$x = \frac{-2 \pm \sqrt{4 - 4 \cdot 1 \cdot 3}}{2}$$



Examples- Graph

$$a=1$$

$$b=4$$

$$c=4$$

$$7.) f(x) = x^2 + 4x + 4$$

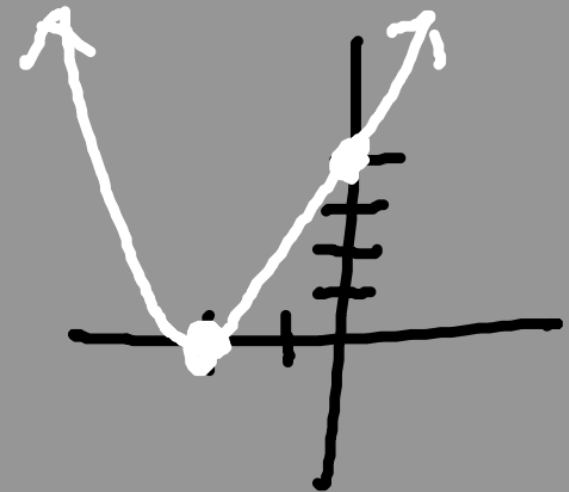
$$x = \frac{-4}{2} = -2$$

$$y = (-2)^2 + 4(-2) + 4$$

$$y = 4 - 8 + 4$$

$$y = 0$$
$$V(-2, 0)$$

$$y\text{-int}(0, 4)$$



Write the equation of parabola

- Use: $f(x) = a(x - h)^2 + k$
 - where (h, k) is the vertex
 - Plug in (h, k) and (x, y) to find “a”
 - Plug in a, h , and k

Examples

1.) $V(h, k), \text{ pt } (x, y)$
 $V(1, 2), \text{ pt } (0, 0)$

$$y = a(x-h)^2 + k$$

$$0 = a(0-1)^2 + 2$$

$$0 = a(1) + 2$$

$$-2 = a$$

$$y = -2(x-1)^2 + 2$$

$\uparrow$
 a

$\uparrow$
 h

$\uparrow$
 k

2.) $V(h, k), \text{ pt } (x, y)$
 $V(2, -3), \text{ pt } (1, 4)$

$$y = a(x-h)^2 + k$$

$$4 = a(1-2)^2 - 3$$

$$4 = a(1) - 3$$

$$7 = a$$

$$y = 7(x-2)^2 - 3$$

Examples

3.) V (-2, 5) pt (3, -2)

$$y = a(x-h)^2 + k$$

$$-2 = a(3+2)^2 + 5$$

$$-2 = a(25) + 5$$

$$-7 = a(25)$$

$$\frac{-7}{25} = a$$

$$y = \frac{-7}{25}(x+2)^2 + 5$$

Textbook

- Pg 133 examples # 5, # 6
- Pg 136 # 78-79

Hmwk

- Pg 135 # 13-16, 18-20, 23-25, 34, 43-46, 77, 80