Name ANSWER KEY

Chapter 2 Polynomial and Rational Functions

Section 2.1 Quadratic Functions

Objective: In this lesson you learned how to sketch and analyze graphs of quadratic functions

Important Vocabulary		
Constant Function	**Linear Function**	**Quadratic Function**
Axis of Symmetry	**Vertex**	

I. The Graph of a Quadratic Function

What you should learn:

How to analyze graphs of quadratic functions

Let n be a nonnegative integer and let $a_n, a_{n-1}, \ldots, a_2, a_1, a_0$ be real numbers with $a_n \neq 0$. A **polynomial function of x with degree n** is given by:

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

a_n is the expression for the N^{th} coefficient

a_0 is the CONSTANT TERM

A quadratic function is a polynomial function of SECOND degree. The graph of a quadratic function is a special "U-shaped" curved called a(n) PARABOLA.

If the leading coefficient of a quadratic function is positive, the graph of the function opens UPWARD and the vertex of the parabola is the MINIMUM point on the graph. If the leading coefficient of a quadratic function is negative, the graph of the function opens DOWNWARD and the vertex of the parabola is the MAXIMUM point on the graph.

II. The Standard Form of a Quadratic Function

What you should learn:

How to write quadratic functions in standard form and use the results to sketch the graphs of functions

The **standard form of a quadratic function is**

$f(x) = a(x-h)^2 + k, \quad a \neq 0$.

$(h, k) \rightarrow$ VERTEX OF THE PARABOLA

For a quadratic function in standard form, the axis (of symmetry) of the associated parabola is

$x=h$ and the vertex is (h,k).

To write a quadratic function in standard form:

USE THE PROCESS OF COMPLETING THE SQUARE

To find the x-intercepts of the graph of $f(x) = ax^2 + bx + c$:

SOLVE THE EQUATION $ax^2+bx+c=0$

III. Finding Minimum and Maximum Values

What you should learn:

How to find minimum and maximum values of quadratic functions in real-life applications

For a quadratic function in the form $f(x) = ax^2 + bx + c$,

when $a > 0$, f has a minimum that occurs at $-B/2a$. When $a < 0$, f has a maximum that occurs at $-B/2A$.

To find the minimum or maximum value:

EVALUATE THE FUNCTION AT $-B/2A$

Section 2.1 Examples – Quadratic Functions

(1) Describe the graph of $f(x) = 2x^2 + 8x + 8$ by identifying the vertex, axis of symmetry, x-intercepts, and direction the graph opens.

$f(x)$ OPENS UPWARD

VERTEX : $(-2, 0)$

A.o.S: $x = -2$

x-INTERCEPT : $(-2, 0)$

$y = 2x^2 + 8x + 8$

$y - 8 = 2(x^2 + 4x)$ — COMPLETING THE SQUARE.

$y - 8 + 8 = 2(x^2 + 4x + \boxed{4})$

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

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

(2) Write the standard form of the equation of the parabola whose vertex is $(1, 2)$ and that passes through the point $(3, -6)$.

H, K

x, y

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

$-6 = a(3-1)^2 + 2$

$-6 = a(4) + 2$

$-8 = 4a$

$a = -2$

$\boxed{y = -2(x-1)^2 + 2}$