Name: _____

Date: _____

Period: _____

Student Workbook

Quadratic Functions

Learning Target: I can find the vertex of a quadratic function, convert between forms, and use quadratics to solve optimization problems.

Vocabulary

Term	Meaning
Standard Form	$f(x) = ax^2 + bx + c$
Vertex Form	$f(x) = a(x-h)^2 + k$, where (h,k) is the vertex
Vertex	The maximum or minimum point of the parabola
Axis of Symmetry	The vertical line $x = h$ that splits the parabola into two mirror-image halves

Key Concept: Finding the Vertex from Standard Form

FORMULA

$h = -b / 2a$ then $k = f(h)$

EXAMPLE 1

Find the vertex of $f(x) = 2x^2 - 8x + 3$.

$h = -(-8)/(2 \cdot 2) =$ _____

$k = f(2) = 2(4) - 16 + 3 =$ _____

Vertex: (_____, _____)

Key Concept: Converting to Vertex Form

EXAMPLE 2

Convert $f(x) = x^2 + 6x + 5$ to vertex form by completing the square.

$f(x) = (x^2 + 6x + 9) - 9 + 5 =$ _____

COMMON MISTAKE

In h = -b/2a, don't forget the negative sign! For f(x)=x²-6x+2 (b=-6), h = -(-6)/2 = 3, NOT -3.

Key Concept: Reading Vertex Form

EXAMPLE 3

f(x) = -4(x-2)² + 9: vertex (2,9), axis of symmetry x=2. Since a=-4<0, the parabola opens downward with a

MAXIMUM value of 9.

Key Concept: Optimization Problems

EXAMPLE 4

A ball's height is modeled by h(t) = -16t² + 64t + 80. Find the maximum height and when it occurs.

t = -64/(2 · -16) = _____

Max height = h(_____) = _____

Guided Practice — Part A: Find the Vertex

A1 f(x) = 3x² - 12x + 7

A2 f(x) = -2x² + 8x - 3

Guided Practice — Part B: Convert to Vertex Form

B1 $f(x) = x^2 - 4x + 9$

B2 $f(x) = x^2 + 10x + 21$

Guided Practice — Part C: Read Vertex Form

C1 $f(x) = -4(x-2)^2 + 9$: vertex, axis of symmetry, max or min, and the value.

C2 $f(x) = 2(x+5)^2 - 3$: vertex, axis of symmetry, max or min, and the value.

Guided Practice — Part D: Optimization

D1 A ball's height: $h(t) = -16t^2 + 48t + 6$. Find the max height and when it occurs.

D2 A farmer has 300m of fencing for a rectangular pen against a barn (only 3 sides need fencing). Maximize the area.

BEFORE YOU MOVE ON

Check with a partner: after finding h with -b/2a, did you plug it back into the ORIGINAL function to find k?