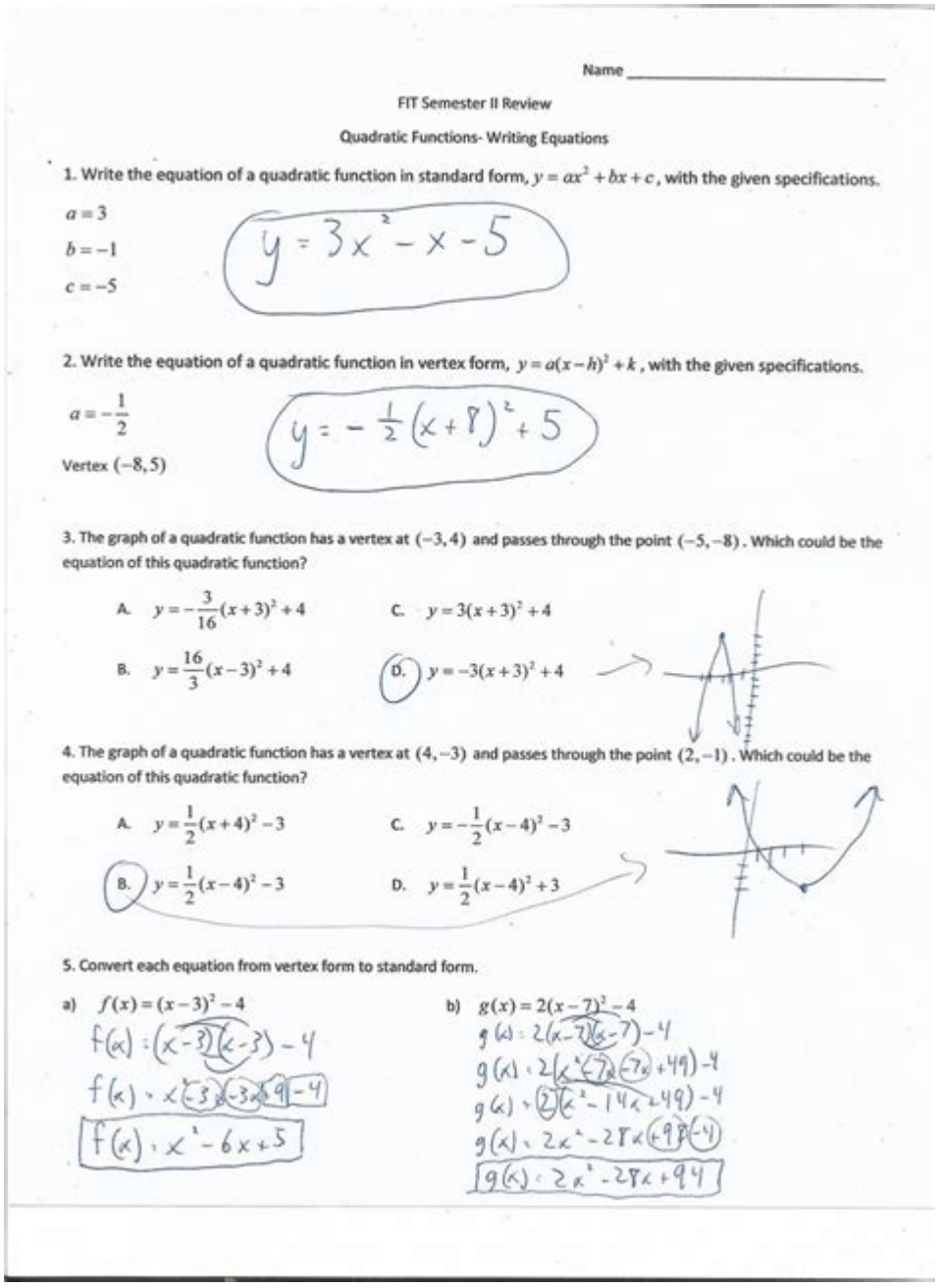
Quadratic Function Answer Key



Name _____

FIT Semester II Review

Quadratic Functions- Writing Equations

1. Write the equation of a quadratic function in standard form, $y = ax^2 + bx + c$, with the given specifications.

$a = 3$

$b = -1$

$c = -5$

$y = 3x^2 - x - 5$

2. Write the equation of a quadratic function in vertex form, $y = a(x-h)^2 + k$, with the given specifications.

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

Vertex $(-8, 5)$

$y = -\frac{1}{2}(x+8)^2 + 5$

3. The graph of a quadratic function has a vertex at $(-3, 4)$ and passes through the point $(-5, -8)$. Which could be the equation of this quadratic function?

A. $y = -\frac{3}{16}(x+3)^2 + 4$

B. $y = \frac{16}{3}(x-3)^2 + 4$

C. $y = 3(x+3)^2 + 4$

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

4. The graph of a quadratic function has a vertex at $(4, -3)$ and passes through the point $(2, -1)$. Which could be the equation of this quadratic function?

A. $y = \frac{1}{2}(x+4)^2 - 3$

B. $y = \frac{1}{2}(x-4)^2 - 3$

C. $y = -\frac{1}{2}(x-4)^2 - 3$

D. $y = \frac{1}{2}(x-4)^2 + 3$

5. Convert each equation from vertex form to standard form.

a) $f(x) = (x-3)^2 - 4$

$f(x) = (x-3)(x-3) - 4$

$f(x) = x^2 - 3x - 3x + 9 - 4$

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

b) $g(x) = 2(x-7)^2 - 4$

$g(x) = 2(x-7)(x-7) - 4$

$g(x) = 2(x^2 - 7x - 7x + 49) - 4$

$g(x) = 2(x^2 - 14x + 49) - 4$

$g(x) = 2x^2 - 28x + 98 - 4$

$g(x) = 2x^2 - 28x + 94$

Quadratic function answer key is a vital resource for students and educators alike, as it simplifies the process of understanding and solving quadratic equations. Quadratic functions, which are polynomial functions of degree two, play a crucial role in algebra and a variety of real-world applications, such as physics, engineering, and economics. This article will explore the key concepts related to quadratic functions, including their standard forms, properties, methods for solving them, and practical applications, while also providing a comprehensive answer key for common quadratic function problems.

Understanding Quadratic Functions

A quadratic function can be expressed in the standard form:

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

where:
- $ a $, $ b $, and $ c $ are constants,
- $ a \neq 0 $,
- $ x $ is the variable.

The graph of a quadratic function is a parabola, which can open either upwards (if $ a > 0 $) or downwards (if $ a < 0 $)). The vertex of the parabola represents the maximum or minimum point of the function, depending on the direction it opens.

Key Characteristics of Quadratic Functions

1. Vertex: The vertex can be found using the formula:
$$ x = -\frac{b}{2a} $$
This gives the x-coordinate of the vertex, and substituting this value back into the quadratic equation yields the y-coordinate.

2. Axis of Symmetry: The line $ x = -\frac{b}{2a} $ acts as the axis of symmetry for the parabola.

3. Y-Intercept: The y-intercept occurs when $ x = 0 $. Thus, it can be found directly from the constant $ c $.

4. X-Intercepts (Roots): The points where the graph intersects the x-axis can be found using the quadratic formula:
$$ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} $$
The expression $ b^2 - 4ac $ is known as the discriminant and determines the nature of the roots:
- If $ b^2 - 4ac > 0 $: two distinct real roots.
- If $ b^2 - 4ac = 0 $: one real root (a repeated root).
- If $ b^2 - 4ac < 0 $: no real roots (complex roots).

5. Direction: The direction of the parabola is determined by the sign of $ a $.

Methods for Solving Quadratic Equations

There are several methods for solving quadratic equations, each suited for different types of problems:

Factoring

Factoring is a method used when the quadratic can be expressed as a product of two binomials. For example:

$$ ax^2 + bx + c = (px + q)(rx + s) $$

To use this method:
1. Find two numbers that multiply to $ ac $ and add to $ b $.
2. Rewrite the quadratic in factored form.
3. Set each factor to zero and solve for $ x $.

Example: Solve $ x^2 + 5x + 6 = 0 $ by factoring.
- Factors of 6 that add to 5 are 2 and 3.
- The equation factors to $ (x + 2)(x + 3) = 0 $.
- Solutions: $ x = -2 $ and $ x = -3 $.

Completing the Square

Completing the square transforms the quadratic into vertex form:

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

where $ (h, k) $ is the vertex.

1. Move $ c $ to the other side.
2. Divide $ b $ by 2, square it, and add to both sides.
3. Factor the left side and simplify.

Example: Solve $ x^2 + 6x + 5 = 0 $ by completing the square.
- Move 5: $ x^2 + 6x = -5 $.
- Take half of 6 (3), square it (9), add to both sides: $ x^2 + 6x + 9 = 4 $.
- Factor: $ (x + 3)^2 = 4 $.
- Solutions: $ x + 3 = 2 $ or $ x + 3 = -2 $; thus, $ x = -1 $ or $ x = -5 $.

Using the Quadratic Formula

This formula can be applied to any quadratic equation and is especially useful when factoring is difficult.

$$ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} $$

Example: Solve $2x^2 + 4x - 6 = 0$.
Here, $a = 2$, $b = 4$, and $c = -6$.
- Calculate the discriminant: $4^2 - 4(2)(-6) = 16 + 48 = 64$.
- Substitute into the formula:
$$ x = \frac{-4 \pm 8}{4} $$
- Roots: $x = 1$ and $x = -3$.

Applications of Quadratic Functions

Quadratic functions are not just abstract concepts; they have numerous applications in various fields:

1. Physics: Modeling projectile motion, where the height of an object is a quadratic function of time.
2. Economics: Analyzing profit maximization and cost functions.
3. Engineering: Designing structures and components that rely on parabolic shapes, such as bridges or satellite dishes.
4. Biology: Population modeling, where growth rates can be represented using quadratic equations.

Quadratic Function Answer Key Examples

Below is an answer key for commonly encountered quadratic function problems:

1. Solve $x^2 - 5x + 6 = 0$.
- Answer: $x = 2, 3$ (Factoring).

2. Solve $3x^2 + 12x + 12 = 0$.
- Answer: $x = -4$ (Discriminant is zero; one real double root).

3. Solve $x^2 + 4x + 5 = 0$.
- Answer: $x = -2 + i$ and $x = -2 - i$ (Complex roots; discriminant is negative).

4. Find the vertex of $f(x) = 2x^2 - 8x + 3$.
- Answer: Vertex at $(2, -5)$.

5. Determine the axis of symmetry for \(f(x) = x^2 - 6x + 8 \).
- Answer: \(x = 3 \).

Conclusion

The study of quadratic functions is fundamental to algebra and various real-world applications. Understanding how to manipulate and solve these functions using different methods enhances mathematical proficiency and problem-solving skills. The quadratic function answer key provided herein serves as a valuable resource for students, educators, and anyone looking to improve their grasp of this essential topic in mathematics. As you practice more problems and explore their applications, the appreciation for the beauty and utility of quadratic functions will undoubtedly grow.

Frequently Asked Questions

What is a quadratic function?

A quadratic function is a polynomial function of degree two, typically written in the standard form $f(x) = ax^2 + bx + c$, where a, b, and c are constants, and a is not equal to zero.

How can I find the vertex of a quadratic function?

The vertex of a quadratic function in the form $f(x) = ax^2 + bx + c$ can be found using the formula for the x-coordinate: $x = -b/(2a)$. Plug this x-value back into the function to find the corresponding y-coordinate.

What methods can be used to solve quadratic equations?

Quadratic equations can be solved using various methods, including factoring, completing the square, and applying the quadratic formula: $x = (-b \pm \sqrt{(b^2 - 4ac)}) / (2a)$.

What does the discriminant of a quadratic function tell us?

The discriminant ($D = b^2 - 4ac$) indicates the nature of the roots of the quadratic equation. If $D > 0$, there are two distinct real roots; if $D = 0$, there is one real root (a repeated root); and if $D < 0$, there are two complex roots.

How do I graph a quadratic function?

To graph a quadratic function, identify the vertex, axis of symmetry, and intercepts. Plot these key points and sketch a parabola opening upwards if $a > 0$ or downwards if $a < 0$. Use additional points if necessary to refine the curve.

Quadratic Function Answer Key

El Clóset de mi Hermana tienda de ropa de mujer en Lima
Tienda de ropa de mujer en Lima, prendas de algodón orgánico y prendas tejidas. Polos básicos de algodón, pantalones, tops tejidos, blusas de algodón, decoración para casa, joyas de …

Banana Republic Perú | Tienda Oficial
Descubre nuestra clásica ropa Banana Republic: vestidos, pantalones, blazer, camisas de lino y mucho más para mujer y hombre.

Top 9 Ropa vintage en Lima
Mil Modelitos es una tienda de ropa y complementos de ocasión. Ofrecemos moda Europea y Americana,...liquidaciones, ropa actual y ropavintage. tenemos todas las tallas, desde la 36 …

Ropa de Mujer ¡Ofertas únicas! | falabella.com
Aprovecha las OFERTAS de Falabella.com en ropa de mujer, compra ropa de moda, ropa de vestir mujer y ropa para mujer de las mejores marcas ¡Entra ya!

ZARA Perú / Peru | Nueva Colección Online
Descubre la nueva colección de ZARA online. Las últimas tendencias para mujer, hombre, niños y los editoriales de la próxima temporada.

10 tiendas para comprar ropa de moda en Lima - MOTT Social
Apr 25, 2019 · Conoce el top de las tiendas para comprar ropa de moda en Lima. Las direcciones y que estilo de prendas ofrecen al público.

Vileidy - Ropa para mujer en Lima, Perú
Llegamos a todo el Perú. Aceptamos todas las tarjetas de Crédito y Débito. Elegancia y calidad en moda femenina. Encuentra el estilo perfecto para destacar.

Ropa para mujer en oferta | Oechsle.pe
Visita Oechsle.pe y encuentra ropa para dama con descuentos increíbles para mantenerte siempre abrigada y a la moda. Con nuestra amplia gama de opciones y precios, renovar tu …

Brujhas - Ropa para mujer, encuentra vestidos, blusas, sacos, y más
Tienda Online. Ropa para una mujer urbana, actual y romántica. Hecho con amor por manos peruanas ♥

Maraz Tienda de Moda Online en Perú | Envíos Seguros
15 años de experiencia diseñando y confeccionando prendas de vestir para mujeres modernas.

An (updated) list of uncensored anime on Crunchyroll (and VRV …
Crunchyroll’s new found friendship with Hidive/Sentai has already led to a few of their shows appearing on Crunchyroll’s main site, which may lead to more …

CrunchyRoll vs HiDive : r/anime - Reddit
Apr 6, 2018 · CrunchyRoll has more content, it has bigger subtitles, and it is a little more convenient to use. But Hidive has some content CrunchyRoll doesn't, …

is the anime uncensored? : r/Crunchyroll - Reddit
Nov 22, 2022 · Welcome to the unofficial subreddit of Crunchyroll, the best place to talk about this streaming service and news regarding the platform! …

How do you remove shows from your Cruchyroll continue watchi…
Feb 4, 2022 · Crunchyroll allows you to watch the first few seconds of a episode or series without adding it to your continue watching list. When you …

Crunchyroll - Reddit
Welcome to the unofficial subreddit of Crunchyroll, the best place to talk about this streaming service and news regarding the platform! Crunchyroll is an …

Back to Home