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Name: _____

Date: _____ Class: Algebra 1, per: _____

Chapter 10 - Bridging Quadratic and Exponential Functions

Objective: I can identify quadratic functions, evaluate them accurately, and analyze their algebraic structure.

For Questions 1-6, show each substitution or algebraic step.

1. Classify $f(x) = 3x^2 - 2x + 7$ as quadratic, exponential, or neither.	**2.** For $q(x) = 2x^2 + 5x - 1$, find $q(-3)$.
3. Write $4 - 3x^2 + 8x$ in standard form $ax^2 + bx + c$ and identify a, b, and c.	**4.** For $q(x) = x^2 - 4x + 6$, find $q(0)$, $q(1)$, and $q(2)$.
5. If $q(x) = x^2 + 3x - 5$, simplify $q(-x)$.	**6.** If $q(x) = x^2 - 2x + 4$, simplify $q(x + 1) - q(x)$.

Chapter 10 - Bridging Quadratic and Exponential Functions

Objective: I can expand, factor, and solve quadratic equations using the Zero Product Property.

Factor completely. For equations, state every real solution.

7. Expand and simplify $(x-5)(x+2)$.	**8.** Factor $x^2+9x+20$.
9. Factor $x^2-6x-16$.	**10.** Factor $3x^2+x-2$.
11. Solve $x^2-7x+12=0$.	**12.** Solve $2x^2-5x-3=0$.

Chapter 10 - Bridging Quadratic and Exponential Functions

Objective: I can solve quadratic equations by square roots and by completing the square.

Give exact answers. Include both square-root solutions when required.

13. Solve $5x^2 = 80$.	**14.** Solve $(x-6)^2 = 49$.
15. Rewrite $x^2 + 10x + 7$ in the form $(x+p)^2 + q$.	**16.** Rewrite $x^2 - 8x + 3$ in the form $(x+p)^2 + q$.
17. Solve $x^2 + 6x - 7 = 0$ by completing the square.	**18.** Solve $x^2 - 4x - 1 = 0$ by completing the square.

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Objective: I can apply the quadratic formula and use the discriminant to classify solutions.

Show the discriminant and simplify all exact answers.

19. Solve $3x^2 + 2x - 8 = 0$ using the quadratic formula.	**20.** Solve $2x^2 + 5x + 1 = 0$ using the quadratic formula.
21. Use the discriminant to determine the number and type of real solutions of $x^2 - 4x + 8 = 0$.	**22.** Use the discriminant to classify and solve $4x^2 - 12x + 9 = 0$.
23. Find the positive value of k that makes $x^2 + kx + 16$ a perfect-square trinomial.	**24.** Find m so that $x^2 - 6x + m = 0$ has exactly one real solution.

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Objective: I can use exponent laws and solve elementary exponential equations exactly.

Write answers with positive exponents and state excluded values when needed.

25. Simplify $\frac{x^3 x^5}{x^2}$.	**26.** Simplify $(2a^3b^{-2})^2$ using positive exponents.
27. Evaluate $3^4 \cdot 3^{-2}$.	**28.** Solve $2^x = 32$.
29. Solve $5^{x+1} = 125$.	**30.** Solve $4^{2x} = 64$.

Chapter 10 - Bridging Quadratic and Exponential Functions

Objective: I can interpret exponential expressions and construct growth, decay, and geometric-sequence models.

Identify initial values and multiplicative factors before calculating.

31. For $f(n) = 6(2)^n$, find $f(0)$, $f(1)$, and $f(4)$.	**32.** For $y = 450(1.08)^t$, state the initial value, factor, and percent rate of change.
33. For $y = 1200(0.85)^t$, state the initial value, factor, and percent rate of change.	**34.** Write an exponential model for an initial amount of 250 that grows 6% per period.
35. Write an exponential model for an initial value of 900 that decreases 12% per year.	**36.** For $5, 15, 45, \ldots$, write an explicit rule and find the next three terms.

Chapter 10 - Bridging Quadratic and Exponential Functions

Objective: I can derive quadratic and exponential rules from values and compare models algebraically.

Show the ratios or finite differences that justify each rule.

37. Find an exponential rule for

x	0	1	2	3
y	4	12	36	108

.

38. Find a quadratic rule for

x	0	1	2	3
y	7	12	19	28

.

39. Find a quadratic rule for

x	0	1	2	3	4
y	2	6	12	20	30

.

40. At $n = 4$, compare $L(n) = 10 + 6n$ and $Q(n) = n^2 + 3$. Which is larger, and by how much?

41. At $t = 5$, compare $Q(t) = t^2 + 8$ and $E(t) = 2^{t+1}$. Which is larger, and by how much?

42. Find the least positive integer n for which $3^n > n^2 + 10$. Justify by testing in order.

43. A rectangle has area 60 square units and length 7 units greater than its width. Find its dimensions.

44. Two consecutive positive integers have product 156. Find the integers.

Chapter 10 - Bridging Quadratic and Exponential Functions

Objective: I can build, solve, and compare quadratic and exponential models in realistic contexts.

Define variables, write an equation or model, solve, and interpret the result.

45. An object's height is $h(t) = -16t^2 + 64t + 80$. When does it reach the ground? Reject impossible time values.	**46.** A revenue model is $R(x) = x(60 - 2x)$. Find every value of x for which the revenue is 400.
47. An investment of $\$1{,}200$ earns 5% interest compounded annually. Find its value after 4 years.	**48.** A medicine dose begins at 80 mg and decreases by 25% each hour. How much remains after 5 hours?
49. Compare $A(t) = 500(1.04)^t$ and $B(t) = 400(1.08)^t$ after 10 periods. Which is larger, and by how much?	**50.** Honors challenge: Solve $2^{2x} - 10(2^x) + 16 = 0$ exactly by using a substitution.

Other topics for review:

- A quadratic expression has degree 2; an exponential variable appears in an exponent.
- Completing the square and the quadratic formula preserve exact radical answers.
- A growth factor is $1 + r$; a decay factor is $1 - r$.
- Constant second differences signal a quadratic pattern; constant ratios signal an exponential pattern.
- Context determines whether negative, fractional, or approximate solutions are meaningful.