DIGITAL

NAME ______________________ DATE ______________

Module 13 Solving Quadratic Equations of One Variable
Lesson 5 Solving Quadratic Equations by the Quadratic Formula

independent practice

Solve each quadratic equation using the quadratic formula.

1. $n^2 + 4n + 4 = 0$
2. $w^2 - 3w - 28 = 0$
3. $x^2 - 24 = -2x$
4. $y^2 - 15 = 2y$
5. $10y^2 + 29y = -10$
6. $3t^2 - 2t = -15$
7. $9x = 2x^2 - 4$
8. $3g + 5 = 4g^2$
9. $8m^2 - m - 1 = 0$
10. $-11b + 4 = 9b^2$

Use the discriminant to determine the number of solutions for each equation. Then, solve the equation using the value of the discriminant.

11. $-7 = m^2 - m$
12. $5x^2 = 3x - 10$
13. $-x = 5x^2 - 19$
14. $9y^2 - 7y = 7$

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Journal

1. Explain why it is important to write quadratic equations in standard form before applying the quadratic formula.
2. What is meant by the symbol ± in the quadratic formula?
3. Annie solved the following quadratic equation using $a = 3$, $b = -1$, and $c = 2$. Will Annie get the correct solution? Explain.

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

4. The quantity $b^2 - 4ac$ is called the *discriminant*. How does the discriminant determine whether a quadratic equation has zero, one, or two real number solutions? Explain.

Cumulative Review

Factor completely.

1. $20 - 5r$ ________________
2. $t^2 + 5t + 6$ ________________
3. $3t^2 - 300$ ________________
4. $30x^2 - 5x - 10$ ________________
5. $-2x^3 - 2x^2 + 5x + 5$ ________________
6. $x^4 - 625$ ________________

Solve by evaluating square roots, factoring, or completing the square.

7. $x^2 = 121$ ________________
8. $(x + 4)^2 = -100$ ________________
9. $x^2 + 6x - 20 = 0$ ________________
10. $5(x - 1)^2 - 2 = 18$ ________________

Graphing Calculator Problem

A quadratic function is of the form $y = ax^2 + bx + c$, where $a \neq 0$. The graph of every quadratic function is a parabola that opens either upward or downward. Such a parabola can intersect the x-axis at zero, one, or two points. The x–coordinates of these points are called the x–intercepts of the graph.

A linear function is of the form $y = ax + b$ (more commonly, $y = mx + b$). The graph of every linear function is a line. Unless the line is the x–axis, a line can intersect the x–axis in at most one place. So, the graph of all linear functions except $y = 0$ has exactly one x–intercept.

The solution(s) to the quadratic equation $ax^2 + bx + c = 0$, where $a \neq 0$, is/are the x–intercepts of the graph of the quadratic function $y = ax^2 + bx + c$. The solution to the linear equation $ax + b = 0$, where $a \neq 0$, is the x-intercept of the graph of the linear function $y = ax + b$.

You can use your graphing calculator to determine whether an equation is a *linear equation* or a *quadratic equation*.

Follow the steps below to determine whether the equation $x - 4x^2 = 5$ is linear, quadratic, or neither.

1. Write the equation in standard form (one side in decreasing degree of x; the other side equal to zero): $0 = 4x^2 - x + 5$
2. Substitute y for zero to write the associated function: $y = 4x^2 - x + 5$.
3. Enter the function $y = 4x^2 - x + 5$ into the calculator; press $\boxed{Y=}$ then $\boxed{CLEAR}$ (if needed). With the cursor on the line $Y_1=$ (user the arrow keys to move it there, if necessary), press $\boxed{4}$ $\boxed{X,T,\theta,n}$ $\boxed{x^2}$ $\boxed{-}$ (do NOT use the $\boxed{(-)}$ key) $\boxed{X,T,\theta,n}$ $\boxed{+}$ $\boxed{5}$. See Figure 1.
4. Graph the function; press $\boxed{GRAPH}$. Press $\boxed{ZOOM}$ $\boxed{6}$ to use the standard window. See Figure 2
5. Look at the shape of the graph. If it is a line, the equation is *linear*. If it is a parabola, it is *quadratic*. If it is neither a line nor a parabola, the function is neither linear nor quadratic. Because the graph of this function is U–shaped, the equation $x - 4x^2 = 5$ is quadratic. Because the parabola does not intersect the x–axis, the equation $x - 4x^2 = 5$ has no real number solutions.

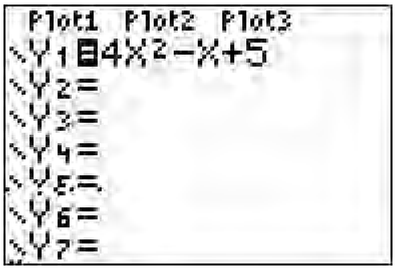

Figure 1

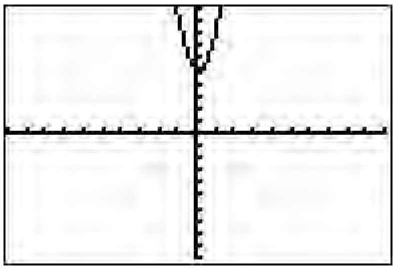

Figure 2

Use your calculator to determine whether each equation is *linear, quadratic*, or *neither*.

1. $4s^2 - 5 = 0$

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2. $3x + 4x^2 = 5$

   ____

3. $d^2(d + 4) = 0$

   ____

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

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