Name _____ Date _____

4-6 to 4-7 Test Review
Algebra 2-1

1. Suppose a model rocket is launched from a platform 2 ft above the ground with an initial upwards velocity of 100 ft/s.

a) Using the equation $h(t) = -16t^2 + v_0 t + h_0$, where $v_0 = initial\ velocity$ and $h_0 = initial\ height$, write an equation that represents the path of the rocket.

$h(t) = -16t^2 + 100t + 2$

b) How long will it take the rocket reach its maximum height? (*HINT: What is the maximum of a parabola?)* Vertex!

$t = \frac{-b}{2a} = \frac{-100}{2(-16)} = \frac{-100}{-32} = 3.125$

3.125 seconds

c) What is the rocket's maximum height?

$h(3.125) = -16(3.125)^2 + 100(3.125) + 2$
$= -16(9.765625) + 312.5 + 2$
$= -156.25 + 312.5 + 2$
$= 156.25 + 2$
$= 158.25$

158.25 ft

d) When will the rocket hit the ground?

6.27 seconds

$0 = -16t^2 + 100t + 2$

$t = \frac{-100 \pm \sqrt{(100)^2 - 4(-16)(2)}}{2(-16)} = \frac{-100 \pm \sqrt{10,000 + 128}}{-32} = \frac{-100 \pm \sqrt{10,128}}{-32}$

$= \frac{-100 \pm 100.64}{-32}$

$\frac{-100 + 100.64}{-32} = \frac{+.64}{-32} = -.02$

$\frac{-100 - 100.64}{-32} = \frac{-200.64}{-32} = 6.27$

e) When will the rocket be at the same height from which it was launched at?

It was launched from 2 ft, so set = 2

$2 = -16t^2 + 100t + 2$
$-2 \quad -2$
$0 = -16t^2 + 100t$
$GCF = 4t$
$0 = 4t(-4t + 25)$

$\frac{4t}{4} = \frac{0}{4}$ $\quad -4t + 25 = 0$
$t = 0$ $\quad -25 \quad -25$
$\frac{-4t}{-4} = \frac{-25}{-4}$

$t = \frac{25}{4} = 6.25$

6.25 seconds

2. Solve the following equations by completing the square. Give your answers in *exact form.*

a. $x^2 + 8x = -6$

$\left(\frac{b}{2}\right)^2 = \left(\frac{8}{2}\right)^2 = (4)^2 = 16$

$x^2 + 8x + 16 = -6 + 16$

$\sqrt{(x+4)^2} = \sqrt{10}$

$x + 4 = \pm\sqrt{10}$

$-4 \quad -4$

$x = \pm\sqrt{10} - 4$

b. $4x^2 - x - 3 = 0$

$+3 \quad +3$

$\frac{4x^2}{4} - \frac{x}{4} = \frac{3}{4}$

$x^2 - \frac{1}{4}x = \frac{3}{4}$

$\left(\frac{b}{2}\right)^2 = \left(\frac{-\frac{1}{4}}{2}\right)^2 = \left(-\frac{1}{4}\cdot\frac{1}{2}\right)^2 = \left(-\frac{1}{8}\right)^2 = \frac{1}{64}$

$x^2 - \frac{1}{4}x + \frac{1}{64} = \frac{16}{16}\left(\frac{3}{4}\right) + \frac{1}{64}$

$\left(x - \frac{1}{8}\right)^2 = \frac{48}{64} + \frac{1}{64}$

$\sqrt{\left(x-\frac{1}{8}\right)^2} = \sqrt{\frac{49}{64}}$

$x - \frac{1}{8} = \pm\frac{7}{8} + \frac{1}{8}$

$+\frac{1}{8}$

$x = \pm\frac{7}{8} + \frac{1}{8}$

$\frac{7}{8} + \frac{1}{8} \qquad -\frac{7}{8} + \frac{1}{8}$

$\frac{8}{8} \qquad -\frac{6}{8}$

$1 \qquad -\frac{3}{4}$

c. $n^2 + 5n - 12 = 6n$

$-6n \quad -6n$

$n^2 - n - 12 = 0$

$+12 \quad +12$

$n^2 - n = 12$

$\left(\frac{b}{2}\right)^2 = \left(-\frac{1}{2}\right)^2 = \frac{1}{4}$

$n^2 - n + \frac{1}{4} = \frac{4}{4}\left(\frac{12}{1}\right) + \frac{1}{4}$

$\left(n - \frac{1}{2}\right)^2 = \frac{48}{4} + \frac{1}{4}$

$\sqrt{\left(n-\frac{1}{2}\right)^2} = \sqrt{\frac{49}{4}}$

$n - \frac{1}{2} = \pm\frac{7}{2}$

$+\frac{1}{2} \qquad +\frac{1}{2}$

$n = \pm 7/2 + \frac{1}{2}$

$\frac{7}{2} + \frac{1}{2} \qquad -\frac{7}{2} + \frac{1}{2} \longrightarrow -\frac{6}{2} = -3$

$8/2 = 4$

d. $2x^2 + 8 = -8x$

$+8x \quad +8x$

$2x^2 + 8x + 8 = 0$

$-8 \quad -8$

$\frac{2x^2 + 8x}{2} = \frac{-8}{2}$

$x^2 + 4x = -4$

$\left(\frac{b}{2}\right)^2 = \left(\frac{4}{2}\right)^2 = 2^2 = 4$

$x^2 + 4x + 4 = -4 + 4$

$\sqrt{(x+2)^2} = \sqrt{0}$

$x + 2 = 0$

$-2 \quad -2$

$x = -2$

3. Solve the following using the quadratic formula. Round answers to the nearest *hundredth* if needed.

a. $5x^2 - 7x - 3 = 0$

$$x = \frac{7 \pm \sqrt{(-7)^2 - 4(5)(-3)}}{2(5)}$$

$$x = \frac{7 \pm \sqrt{49 + 60}}{10}$$

$$x = \frac{7 \pm \sqrt{109}}{10}$$

$$x = \frac{7 \pm 10.44}{10}$$

$\frac{7+10.44}{10}$ $\qquad$ $\frac{7-10.44}{10}$

$\frac{17.44}{10}$ $\qquad$ $\frac{-3.44}{10}$

1.74 $\qquad$ −0.34

b. $3x^2 + 3 = 6x$

$-6x \quad -6x$

$$3x^2 - 6x + 3 = 0$$

$$x = \frac{6 \pm \sqrt{(-6)^2 - 4(3)(3)}}{2(3)}$$

$$x = \frac{6 \pm \sqrt{36 - 36}}{6}$$

$$x = \frac{6 \pm \sqrt{0}}{6}$$

$$x = \frac{6 \pm 0}{6}$$

$$x = \frac{6}{6}$$

$x = 1$

c. $7k^2 - 2k = 12$

$$7k^2 - 2k - 12 = 0$$

$$k = \frac{2 \pm \sqrt{(-2)^2 - 4(7)(-12)}}{2(7)}$$

$$k = \frac{2 \pm \sqrt{4 + 336}}{14}$$

$$k = \frac{2 \pm \sqrt{340}}{14}$$

$$k = \frac{2 \pm 18.44}{14}$$

$\frac{2+18.44}{14}$ $\qquad$ $\frac{2-18.44}{14}$

$\frac{20.44}{14}$ $\qquad$ $\frac{-16.44}{14}$

1.46 $\qquad$ −1.17

d. $4v^2 + 15v + 7 = 9v - 4$

$-9v \quad +4 \quad -9v \quad +4$

$$4v^2 + 6v + 11 = 0$$

$$v = \frac{-6 \pm \sqrt{6^2 - 4(4)(11)}}{2(4)}$$

$$v = \frac{-6 \pm \sqrt{36 - 176}}{8}$$

$$v = \frac{-6 \pm \sqrt{-140}}{8}$$

$$v = \frac{-6 \pm i\sqrt{140}}{8}$$

No Real Solution

4. Solve the following using square roots. Give *exact answers*.

a) $4x^2 = 16$

$\frac{4x^2}{4} = \frac{16}{4}$

$\sqrt{x^2} = \sqrt{4}$

$x = \pm 2$

b) $20x^2 - 60 = 80$

$+60 \quad +60$

$\frac{20x^2}{20} = \frac{140}{20}$

$\sqrt{x^2} = \sqrt{7}$

$x = \pm\sqrt{7}$

c) $3(x-4)^2 = 20$

$\frac{3(x-4)^2}{3} = \frac{20}{3}$

$\sqrt{(x-4)^2} = \sqrt{10}$

$x - 4 = \pm\sqrt{10}$

$+4 \quad +4$

$x = \pm\sqrt{10} + 4$

d) $-3(x+4)^2 - 3 = 24$

$+3 \quad +3$

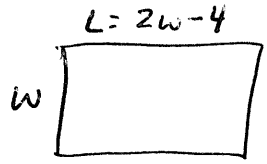
$\frac{-3(x+4)^2}{-3} = \frac{27}{-3}$

$\sqrt{(x+4)^2} = \sqrt{-9}$

$x + 4 = \pm 3i$

No real solutions

5. Your girl Margaret is planning a rectangular garden. Its length is 4 feet less than twice its width. Its area is 170 feet squared. What are the dimensions of the garden?



$A = LW$

$170 = (2w - 4)w$

$170 = 2w^2 - 4w$

$-170 \quad -170$

$0 = 2w^2 - 4w - 170$

$0 = 2(w^2 - 2w - 85)$

$w = \frac{2 \pm \sqrt{(-2)^2 - 4(1)(-85)}}{2(1)} = \frac{2 \pm \sqrt{4 + 340}}{2} = \frac{2 \pm \sqrt{344}}{2} = \frac{2 \pm 18.55}{2}$

$\frac{2 + 18.55}{2} \quad \frac{2 - 18.55}{2}$

$\frac{20.55}{2} \quad \frac{-16.55}{2}$

$10.28 \quad -8.28$

$w = 10.28$ ft

$L = 2(10.28) - 4$

$L = 20.56 - 4$

$L = 16.56$ ft

6. Your local bakery sells bagels when it reduces its prices, but when that happens its profit changes. The function $y = -1000x^2 + 1100x - 2.5$ models the bakery's daily profit in dollars from selling bagels, where x is the price of a bagel in dollars. What's the highest price the bakery can charge to make a profit of $200?

$200 = -1000x^2 + 1100x - 2.5$

$-200 \qquad -200$

$0 = -1000x^2 + 1100x - 202.5$

$$x = \frac{-1100 \pm \sqrt{1100^2 - 4(-1000)(-202.5)}}{2(-1000)}$$

$$x = \frac{-1100 \pm \sqrt{1{,}210{,}000 - 810{,}000}}{-2000}$$

$$x = \frac{-1100 \pm \sqrt{400{,}000}}{-2000}$$

$$x = \frac{-1100 \pm 632.46}{-2000}$$

$$\frac{-1100+632.46}{-2000} \qquad \frac{-1100-632.46}{-2000}$$

0.23 0.87

$0.87 per bagel