Name: Key Date: Hour:

Algebra 1
Unit 9B Test Review

I. Solving by factoring – Find the zeros of each function.

1. $5x^2 - 15 = -10x$

$+10x \quad +10x$

$5x^2+10x-15=0$

$5(x^2+2x-3)=0$

$(x^2+3x)+(-x-3)=0$

$x(x+3)-1(x+3)=0$

$x-1=0 \quad +1+1 \quad x=1$

$x+3=0 \quad -3-3 \quad x=-3$

$x=1,-3$

2. $4x^2 = 16x$

$-16x \quad -16x$

$4x^2-16x=0$

$4x(x-4)=0$

$\frac{4x}{4}=\frac{0}{4} \quad x=0$

$x-4=0 \quad +4+4 \quad x=4$

$x=0,4$

3. $3x^2 + 9x = 12$

$-12 \quad -12$

$3x^2+9x-12=0$

$3(x^2+3x-4)=0$

$(x^2+4x)+(-x-4)=0$

$x(x+4)-1(x+4)=0$

$x-1=0 \quad +1+1 \quad x=1$

$x+4=0 \quad -4-4 \quad x=-4$

$x=1,-4$

4. $\frac{6x^2}{6} = \frac{6}{6}$

$\sqrt{x^2} = \sqrt{1}$

$x = \pm 1$

$x=1,-1$

5. $6x^2 + 23x = 4$

$-4 \quad -4$

$6x^2+23x-4=0$

$(6x^2+24x)+(-x-4)=0$

$6x(x+4)-1(x+4)=0$

$6x-1=0 \quad +1+1 \quad \frac{6x}{6}=\frac{1}{6} \quad x=\frac{1}{6}$

$x+4=0 \quad -4-4 \quad x=-4$

$x=\frac{1}{6},-4$

6. $-3x^2 + 27 = 0$

$-27 \quad -27$

$-3x^2 = -27$

$\frac{-3x^2}{-3} = \frac{-27}{-3}$

$\sqrt{x^2} = \sqrt{9}$

$x = \pm 3$

$x=3,-3$

II. Solve using the quadratic formula – Find the roots of each equation.

7. $4x^2 - 8x = 3$

$-3 \quad -3$

$4x^2-8x-3=0$

$\frac{-(-8) \pm \sqrt{(-8)^2-4(4)(-3)}}{2(4)}$

$\frac{8 \pm \sqrt{112}}{8}$ $\quad \sqrt{112}: 2, 56, 7, 8, 2, 4, 22$

$\frac{8 \pm 4\sqrt{7}}{8} = \frac{8}{8} \pm \frac{4\sqrt{7}}{8}$

$= 1 \pm \frac{\sqrt{7}}{2}$

8. $2x^2 + 8x = 1$

$-1 \quad -1$

$2x^2+8x-1=0$

$\frac{-8 \pm \sqrt{(8)^2-4(2)(-1)}}{2(2)}$

$\frac{-8 \pm \sqrt{72}}{4}$ $\quad \sqrt{72}: 8, 9, 2, 4, 3, 3, 22$

$\frac{-8 \pm 6\sqrt{2}}{4} = \frac{-8}{4} \pm \frac{6\sqrt{2}}{4}$

$= -2 \pm \frac{3\sqrt{2}}{2}$

9. $2x^2 = 8x - 3$

$-8x \quad +3$

$2x^2-8x+3=0$

$\frac{-(-8) \pm \sqrt{(-8)^2-4(2)(3)}}{2(2)}$

$\frac{8 \pm \sqrt{40}}{4}$ $\quad \sqrt{40}: 4, 10, 2, 2, 5$

$\frac{8 \pm 2\sqrt{10}}{4} = \frac{8}{4} \pm \frac{2\sqrt{10}}{4}$

$= 2 \pm \frac{\sqrt{10}}{2}$

10. $2x^2 + 7 = 10x$

$-10x \quad -10x$

$2x^2-10x+7=0$

$\frac{-(-10) \pm \sqrt{(-10)^2-4(2)(7)}}{2(2)}$

$\frac{10 \pm \sqrt{44}}{4}$ $\quad \sqrt{44}: 4, 11, 2, 22$

$\frac{10 \pm 2\sqrt{11}}{4} = \frac{10}{4} \pm \frac{2\sqrt{11}}{4}$

$= \frac{5}{2} \pm \frac{\sqrt{11}}{2}$

III. Application Problems

11. The height in feet that a football is kicked can be modeled by the function $f(x) = -16x^2 + 64x$.

a) What is the maximum height the football will reach?

vertex

$\frac{-b}{2a} = \frac{-64}{2(-16)} = \frac{-64}{-32} = 2$

$-16(2)^2 + 64(2) = 64$

max = 64 ft

b) How long is the football in the air?

$-16x^2 + 64x = 0$

$-16x(x-4) = 0$

$-16x = 0 \quad x - 4 = 0$

$\frac{-16x}{-16} = 0 \quad +4 \; +4$

$x = 0, 4$

4 sec

12. As Molly dives into her pool, her height above the water can be modeled by the function $f(x) = -16x^2 + 72x$, where x is the time in seconds after she begins diving. How long does it take Molly to reach the pool?

$-16x^2 + 72x = 0$

$-8x(2x-9) = 0$

$-8x = 0 \quad 2x - 9 = 0$

$\frac{-8x}{-8} = 0 \quad x = 0$

$2x - 9 = 0$

$+9 \; +9$

$\frac{2x}{2} = \frac{9}{2}$

$x = 9/2 = 4.5$

4.5 sec

13. An Olympic diver's height can be modeled by the function $f(x) = -3x^2 + 6x + 24$, where x is the time in seconds after he begins the dive. How long does it take the diver to hit the water?

$-3x^2 + 6x + 24 = 0$

$-3(x^2 - 2x - 8) = 0$

$(x^2 - 4x) + (2x - 8) = 0$

$x(x-4) + 2(x-4) = 0$

$x + 2 = 0 \quad x - 4 = 0$

$-2 \; -2 \quad +4 \; +4$

$x = -2 \quad x = 4$

4 sec

14. A diver begins on a platform 11 meters above the surface of the water. The diver's height is given by the equation $h(t) = -2t^2 + t + 11$, where t is the time in seconds after the diver jumps. How long does it take the diver to reach a point one meter above the water?

$1 = -2x^2 + x + 11$

$-1 \quad -1$

$-2x^2 + x + 10 = 0$

$\frac{-1 \pm \sqrt{(1)^2 - 4(-2)(10)}}{2(-2)}$

$\frac{-1 \pm \sqrt{81}}{-4}$

$\frac{-1 \pm 9}{-4}$

$\frac{-1+9}{-4} = -2$

$\frac{-1-9}{-4} = \frac{5}{2} \; (2.5)$

2.5 sec

15. The height is feet of a soccer ball kicked upward from the ground with initial velocity 60 feet per second is modeled by $h = -16t^2 + 60t$, where t is the time in seconds. Find the time it takes for the ball to return to the ground. Round to the nearest tenth of a second.

$-16x^2 + 60x = 0$

$-4x(4x - 15) = 0$

$-4x = 0$

$\frac{-4x}{-4} = 0$

$x = 0$

$4x - 15 = 0$

$+15 \; +15$

$\frac{4x}{4} = \frac{15}{4}$

$x = \frac{15}{4} \quad x = 3.75$

3.75 sec

16. For a scene in a movie, a sack of money is dropped from a roof of a 576 ft skyscraper. The height of the sack above the ground is given by $h = -16t^2 + 576$, where t is the time in seconds. How long will it take the sack to reach the ground? Round to the nearest tenth of a second.

$-16x^2 + 576 = 0$

$-576 \quad -576$

$\frac{-16x^2}{-16} = \frac{-576}{-16}$

$\sqrt{x^2} = \sqrt{36}$

$x = \pm 6$

$x = 6, -6$

6 sec

17. The height of a pumpkin launched from a cannon is given by the function $h = -16t^2 + 224t + 240$ where t is the time in seconds. How many seconds is the pumpkin in the air? Round your answer to the nearest tenth of a second.

$-16x^2 + 224x + 240 = 0$

$\frac{-224 \pm \sqrt{(224)^2 - 4(-16)(240)}}{2(-16)}$

$\frac{-224 \pm \sqrt{65,536}}{-32} =$

$\frac{-224 \pm 256}{-32}$

$\frac{-224 + 256}{-32} = -1$

$\frac{-224 - 256}{-32} = 15$

15 sec

18. A rock is thrown from the top of a tall building. The distance, in feet, between the rock and the ground *x* seconds after it is thrown is given by $f(x) = -16x^2 - 4x + 382$. How long after the rock is thrown is it 340 feet from the ground?

$-16x^2 - 4x + 382 = 340$

$-340 \quad -340$

$-16x^2 - 4x + 42 = 0$

$\frac{-(-4) \pm \sqrt{(-4)^2 - 4(-16)(42)}}{2(-16)}$

$\frac{4 \pm \sqrt{2704}}{-32}$

$\frac{4 \pm 52}{-32}$

$\frac{4+52}{-32} = -1.75$

$\frac{4-52}{-32} = 1.5$

1.5 sec

19. A football is being punted and the height of the ball can be modeled by the equation $h = -16t^2 + 32t + 5$, where h is the height in feet and t is the time in seconds. What is the initial height of the football?

$-16x^2 + 32x + 5$

initial height = 5 ft

when time = 0 so it's always your 'c' value