ALGEBRA RH **QUADRATIC APPLICATIONS PRATICE**

1. Courtney is building a rectangular wading pool. She wants the area of the bottom to be $54ft^2$. She also wants the length of the pool to be 3 feet longer than twice the width. What are the dimensions of the pool?

$A = 54ft^2$ x

$2x+3$

x = width = 4.5ft

$2x+3$ = length

$= 2(4.5)+3$

$= 12$ ft

$x(2x+3) = 54$

$2x^2+3x = 54$

$2x^2+3x-54 = 0$

$2x^2+12x-9x-54=0$ AC: -108 B = 3

$2x(x+6)-9(x+6)=0$

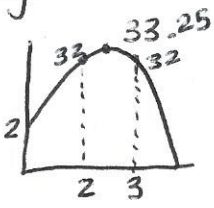
$(2x-9)(x+6)=0$

$x=4.5$ | $x \neq -6$ reject

2. A water balloon is catapulted into the air so that its height *h*, in meters, after *t* seconds is $h(t) = -5t^2 + 25t + 2$.

t = time (seconds)

h = height (meters)



a. How high is the balloon after 1 second?

$h(1) = -5(1)^2 + 25(1) + 2$

$= 22$ meters

b. When is the balloon 32 meters or higher?

$y \geq 32$

Between 2 and 3 seconds

$-5t^2+25t+2 \geq 32$

$-5t^2+25t-30 \geq 0$

$-5(t^2-5t+6) \geq 0$

$-5(t-3)(t-2) \geq 0$

$t-3=0$ | $t-2=0$

$t=3$ | $t=2$

c. What is the maximum height of the balloon?

y value of vertex

$x = \frac{-b}{2a} = \frac{-25}{2(-5)} = 2.5$

$y = -5(2.5)^2 + 25(2.5) + 2 \rightarrow$ 33.25 meters

d. When will the balloon burst upon hitting the ground? Round to the nearest hundredth.

root (zero)

$0 = -5t^2+25t+2$

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

$a = -5$

$b = 25$

$c = 2$

$x = \frac{-25 \pm \sqrt{(25)^2-4(-5)(2)}}{2(-5)}$

$x = \frac{-25 \pm \sqrt{665}}{-10}$

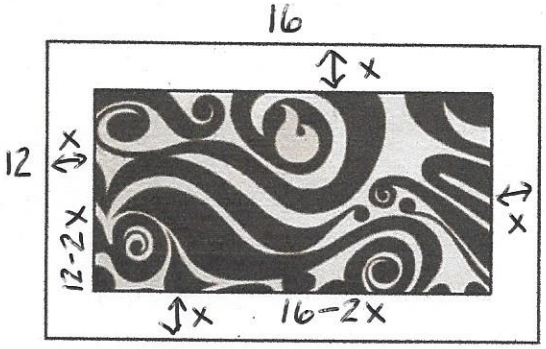
$x = \frac{-25+\sqrt{665}}{-10}$, $\frac{-25-\sqrt{665}}{-10}$

$= -0.07875..$ reject

$= 5.078759392$

$= 5.08$ seconds

3. A rectangular mural is to be drawn centered on a wall in the school cafeteria as shown below. The wall is 16m by 12m and the mural needs to cover 75% of the total area of the wall. What are the dimensions, to the nearest tenth, of the mural? Solve algebraically.



width of mural: $12-2x$
length of mural: $16-2x$

$(16)(12)(.75) = \text{area of mural} = 144$

$(16-2x)(12-2x) = 144$

$192-32x-24x+4x^2 = 144$

$4x^2-56x+192 = 144$

$4x^2-56x+48 = 0$

$x^2-14x+12 = 0$

$a = 1$, $b = -14$, $c = 12$

$$x = \frac{14 \pm \sqrt{(-14)^2-4(1)(12)}}{2(1)}$$

see bottom of page for work and answer

4. The function $h = -16t^2 + 1700$ gives an object's height h, in feet, at t seconds.

a. What does the number 1700 mean in context?

initial height of the object 1700 feet

b. What does the coefficient of t^2 tell you about the end behavior of the object.

the object will eventually fall (gravity presses down on it)
ends approach $-\infty$

c. When will the object be 676 feet above the ground?

y value

$676 = -16t^2+1700$

$0 = -16t^2+1024$

$0 = -16(t^2-64)$

$0 = -16(t-8)(t+8)$

$t = 8$ | $t = -8$ reject

the object will take 8 seconds to reach the ground

d. What is a reasonable domain and range for this function? Express in both inequality notation and interval notation.

vertex $x = \frac{-b}{2a} = \frac{0}{2(-16)} = 0$

$y = -16(0)^2+1700$

$= 1700$

domain: $0 \le x \le 10.31$

$[0, 10.31]$

root nearest hundredth

$0 = -16t^2+1700$

$0 = -16(t^2-106.25)$

$0 = -16(t-10.31)(t+10.31)$

$t = 10.31, -10.31$

range: $0 \le y \le 1700$

$[0, 1700]$

#3 continued

$x = \frac{14 \pm \sqrt{148}}{2}$

$x = \frac{14 \pm \sqrt{4}\sqrt{37}}{2}$

$x = \frac{14 \pm 2\sqrt{37}}{2}$

$x = 7+\sqrt{37}$ or $7-\sqrt{37}$

≈ 13.08 reject ≈ 0.92

width of mural is $12-2x$

$12-2(13.08)$

-14.16

X

$12-2(0.92)$

10.16 m

length of mural is $16-2x$

$16-2(0.92)$

14.16

mural is 10.2m by 14.2m