Algebra Math 95 Name: Key Date:

Take Home Quiz # 4

All problems 2 pts except # 9 = 4pts.

- Justify and show the means by which you arrive at your answers using equations, pictures, calculations, geometry, algebra steps, and/or technology. *You will not receive full credit if your answer is not supported by work that is legible and organized.*
- Place a box around your final answer. *It won't be graded if you do not do this!*
- Make your answers and their presentation in a professional and easily understandable format ... make this your clearest and best work! *Points will be deducted for disorganized, sloppy work.*

11.4

1. The flight of a baseball can be modeled by the function $h(x) = -.02x^2 + 2.4x + 3$.
Where h = height of the ball and x = distance from home plate. Use the quadratic equation to find how long the ball travels before it hits the ground.

Let $h(x)=0$ $\quad 0 = -.02x^2 + 2.4x + 3$

$$x = \frac{-(2.4) \pm \sqrt{(2.4)^2 - 4(-.02)(3)}}{2(-.02)} = 121.237$$

$\approx$ 121.2 ft

2. Two pipes are connected to the same tank. Working together, they can fill the tank in 2 hr. The larger pipe working alone can fill the tank in 3 hours less than the smaller one. How long would the smaller one take, working alone, to fill the tank?

Let t = time for small hose to fill tank

$t-3$ = time for large hose to fill tank

Large hose rate $= \frac{1}{t-3}$ small hose rate $= \frac{1}{t}$

Work = rate · time

$1 = \left(\frac{1}{t} + \frac{1}{t-3}\right) \cdot 2$

$t(t-3) \cdot 1 = \left(\frac{2}{t} + \frac{2}{t-3}\right) \cdot t(t-3)$

$t(t-3) = 2(t-3) + 2t$

$t^2 - 3t = 4t - 6$

$t^2 - 7t + 6 = 0$

$(t-6)(t-1) = 0$

$t = 6$ or $t = 1$ → implies Large Hose time of -2

Smaller Hose takes 6 hours

11.5

3. Find all real solutions. $x^4 - 9x^2 + 20 = 0$

Let $u = x^2$

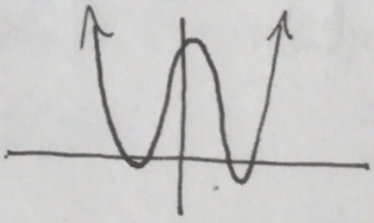
$u^2 - 9u + 20 = 0$

$(u-4)(u-5) = 0$

$u = 4$ or $u = 5$

$x^2 = 4$ or $x^2 = 5$

$x = \pm 2, \pm\sqrt{5}$



4. Find all real solutions. $(2-\sqrt{x})^2+3(2-\sqrt{x})^2-10=0$

as a quadratic trinomial (if you assumed it was a typo)

Let $u=2-\sqrt{x}$

$u^2+3u^2-10=0$

$4u^2=10$

$u^2=\frac{10}{4}$

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

$u^2+3u-10=0$

$(u+5)(u-2)=0$

$u=-5$ or $u=2$

$2-\sqrt{x}=\frac{\sqrt{10}}{2}$ or $2-\sqrt{x}=\frac{-\sqrt{10}}{2}$

$\sqrt{x}=\frac{4-\sqrt{10}}{2}$ $\quad \frac{4+\sqrt{10}}{2}=\sqrt{x}$

$x=\left(\frac{4-\sqrt{10}}{2}\right)^2=\frac{16-8\sqrt{10}}{4}=\frac{13-4\sqrt{10}}{2}$ OK

$x=\left(\frac{4+\sqrt{10}}{2}\right)^2=\frac{14+8\sqrt{10}}{4}=\frac{13+4\sqrt{10}}{2}$

$2-\sqrt{x}=-5$

$7=\sqrt{x}$

$49=x$

$2-\sqrt{x}=2$

$0=\sqrt{x}$

$0=x$ 49 OK

$x=0, 49$ → $x=0$

5. Find the $x-$ intercepts of this function. If none exist, state this. $f(x)=x^{\frac{1}{2}}-x^{\frac{1}{4}}-6$

Let $x^{\frac{1}{4}}=u$

$0=u^2-u-6$

$0=(u-3)(u+2)$

$u=3$ or $u=-2$

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

$x=3^4=9^2=81$ $\quad x=(-2)^4=4^2=16$

Check

$f(81)=81^{\frac{1}{2}}-81^{\frac{1}{4}}-6$

$=9-3-6$

$=0$ ✓

$f(16)=16^{\frac{1}{2}}-16^{\frac{1}{4}}-6$

$=4-2-6$

$=-4\neq 0$

$x=81, 16$ → one solution → $x=81$

11.6

6. for the function $f(x)=-3(x+5)^2-13$,

a. Does the parabola open up or down?

Down because the "a" value is negative

b. What is the vertex of the parabola?

$(-5, -13)$

7. Given the function $g(x) = x^2 + 2x - 6$

c. Find the vertex of the parabola $g(-1) = (-1)^2 + 2(-1) - 6 = -7$ Vertex: $(-1, -7)$

d. Give the axis of symmetry $x = \frac{-b}{2a} = \frac{-2}{2} = -1$ $x = -1$

e. Find the x-intercepts of the parabola $0 = x^2 + 2x - 6$

$x = \frac{-2 \pm \sqrt{2^2 - 4(1)(-6)}}{2}$

$x = \frac{-2 \pm \sqrt{28}}{2}$

$x = \frac{-2 \pm 2\sqrt{7}}{2}$

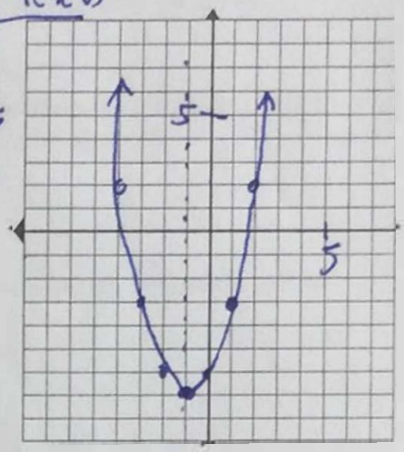
$x = -1 \pm \sqrt{7}$

$x = -1 \pm \sqrt{7}$ 1.64, −3.646

f. Find the y-intercept of the parabola

$g(0) = -6$

8. Sketch a graph of $g(x) = x^2 + 2x - 6$ on the grid to the right.



Give the domain and range of the function.
Write your answers in interval notation.

D: $(-\infty, \infty)$

R: $[-7, \infty)$

11.7
(4 pts)

9. Complete the square to write the function in *vertex form*. Then Find the coordinates of the vertex and draw a graph of $f(x) = 3x^2 - 18x + 15$

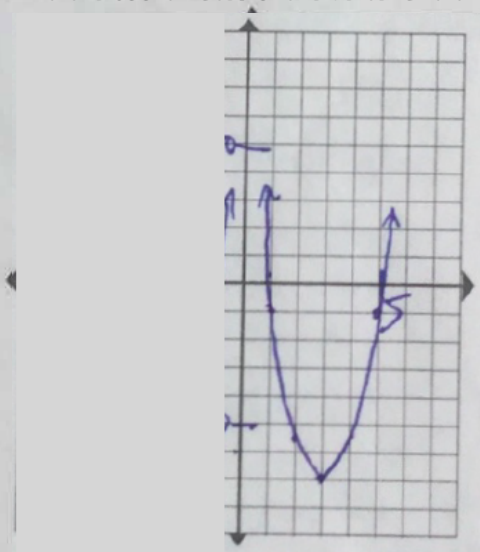
$f(x) = 3(x^2 - 6x \quad) + 15$

$= 3(x^2 - 6x + 9 - 9) + 15$

$= 3(x^2 - 6x + 9) - 27 + 15$

$f(x) = 3(x-3)^2 - 12$

Vertex $(3, -12)$



10. The flight of a baseball can be modeled by the function $h(x) = -.02x^2 + 2.4x + 3$.
Where h = height of the ball and x = distance from home plate. Find the maximum height it reaches.
Describe/show your process.

Max height is at vertex

$x = \frac{-b}{2a} = \frac{-2.4}{2(-.02)} = 60$ ft

$h(60) = -.02(60)^2 + 2.4(60) + 3$

$= 75$ ft