Name: Key

Math 121, College Algebra – Crawford

Exam 2-A/B

12 April 2017

Note: Version B questions may be in a different order.

- Books or notes (in any form) are not allowed.
- You may use a calculator, but show all work.
- ***Show all your work*** – partial credit may be given for written work.
- Clearly indicate your answers.
- Problems 6, 7, 8, and 9 will count toward extra credit on Quiz 4.
- Good Luck!

	Score
1	/12
2	/6
3	/14
4	/6
5	/14
6	/6
7	/4
8	/6
9	/6
10	/6
11	/12
12	/10
Total	/100

Formulas that may or may not be helpful:

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

1. (12 pts). Write an equation of a line with the given properties. Write your final answer in the form $y = mx + b$.

(a). Passes through the points $(3, 4)$ and $(5, 4)$.

$m = \frac{4-4}{5-3} = \frac{0}{2} = 0$

$y - 4 = 0(x-3)$

$y - 4 = 0$

$\boxed{y = 4}$

(b). Passes through the point $(2, -1)$ and is perpendicular to the line $4x + 6y = 6$.

$y + 1 = \frac{3}{2}(x-2)$

$y + 1 = \frac{3}{2}x - 3$

$\boxed{y = \frac{3}{2}x - 4}$

$-4x \quad -4x$

$6y = -4x + 6$

$y = \frac{-4x+6}{6}$

$= -\frac{4}{6}x + \frac{6}{6}$

$= -\frac{2}{3}x + 1$

$\uparrow m = -\frac{2}{3}$

So $m_\perp = \frac{3}{2}$

2. (6 pts). A pharmaceutical salesperson receives a monthly salary of \$2500 plus a commission of 7% of sales. Write a ***linear*** equation for the salesperson's monthly wages W in terms of monthly sales s.

Version B

$\boxed{W = 2500 + .07S}$

$\boxed{W = 3000 + .05S}$

3. (14 pts). Solve the following equations for x. Check your solutions and clearly indicate your answer.

(a). $\sqrt{x+3} - 6 = 0$

$\sqrt{x+3} = 6$

$(\sqrt{x+3})^2 = (6)^2$

$x+3 = 36$

$-3 \quad -3$

$\boxed{x = 33}$

Check:

$\sqrt{33+3} - 6 \stackrel{?}{=} 0$

$\sqrt{36} - 6 = 0$

$6 - 6 = 0$

$0 = 0$ ✓

Version B

$\sqrt{x+5} - 10 = 0$

$\sqrt{x+5} = 10$

$(\sqrt{x+5})^2 = (10)^2$

$x+5 = 100$

$-5 \quad -5$

$\boxed{x = 95}$

(b). $|4 - 2x| = 6x$

$4 - 2x = 6x$

$4 = 8x$

$\frac{4}{8} = \frac{8x}{8}$

$\boxed{\frac{1}{2} = x}$ Only Soln

OR

$-(4 - 2x) = 6x$

$-4 + 2x = 6x$

$-4 = 4x$

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

$-1 = x$

Extraneous

Check

$x = \frac{1}{2}$: $|4 - 2(\frac{1}{2})| \stackrel{?}{=} 6(\frac{1}{2})$

$|4 - 1| = 3$

$|3| = 3$

$3 = 3$ ✓

$x = -1$: $|4 - 2(-1)| \stackrel{?}{=} 6(-1)$

$|4 + 2| = -6$

$|6| = -6$

$6 = -6$ No!

4. (6 pts). Solve the following linear inequality. Then **graph** the solution on the real number line.

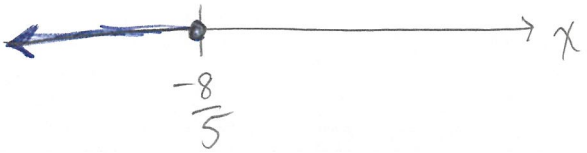
$-2(x+2) \geq 3x + 4$

$-2x - 4 \geq 3x + 4$

$-3x + 4 \quad -3x + 4$

$-5x \geq 8$

$\boxed{x \leq \frac{8}{-5}}$



Version B

$-2(x+2) < 3x + 4$

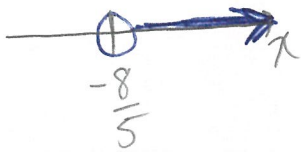
$-2x - 4 < 3x + 4$

$-3x + 4 \quad -3x + 4$

$-5x < 8$

$\frac{-5x}{-5} > \frac{8}{-5}$

$\boxed{x > -\frac{8}{5}}$



5. (14 pts). Solve the following nonlinear inequalities. Then **graph** the solution on the real number line.

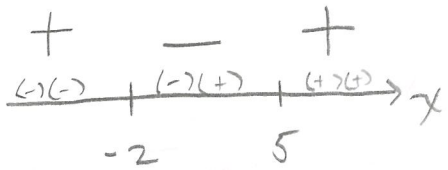
(a). $x^2 - 3x - 9 > 1$

$x^2 - 3x - 10 > 0$

$(x-5)(x+2) > 0$ ★ TRUE when positive

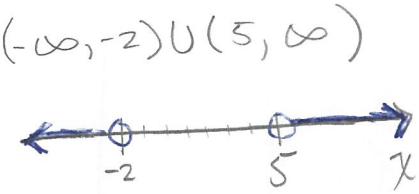
$x - 5 = 0 \quad x + 2 = 0$

$x = 5, -2$



$x = -10 \quad x = 0 \quad x = 10$ ← Test Values

$(-\infty, -2) \cup (5, \infty)$



Version A

Version B

$x^2 - 3x - 9 < 1$

$x^2 - 3x - 10 < 0$

$(x-5)(x+2) < 0$ True when negative

(Same Work)

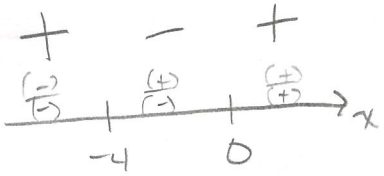
$(-2, 5)$

(b). $\dfrac{x+4}{x} \leq 0$ ★ True when neg. or zero

Equals 0 | Undefined

$x + 4 = 0$ | $x = 0$

$x = -4$



$x = -10 \quad x = -1 \quad x = 10$

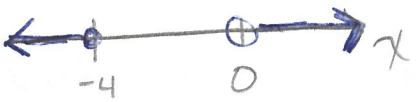
$[-4, 0)$

Version B

$\dfrac{x+4}{x} \geq 0$ True when pos. or zero

(Same Work)

$(-\infty, -4] \cup (0, \infty)$



6. (6 pts). Determine whether the following function is odd, even, or neither. [You must show algebraic work to justify your answer.]

$f(x) = x^3 + x$

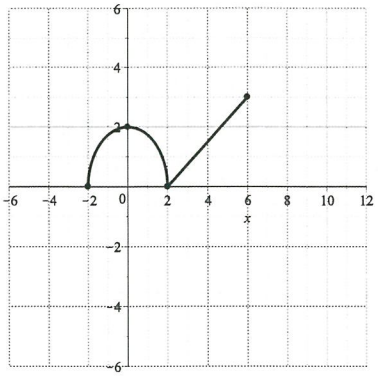
$f(-x) = (-x)^3 + (-x)$

$= -x^3 - x \quad \neq f(x) \Rightarrow$ Not Even

$= -(x^3 + x)$

$= -f(x)$ ← ODD

7. (4 pts). Given the graph of $f(x)$ below,

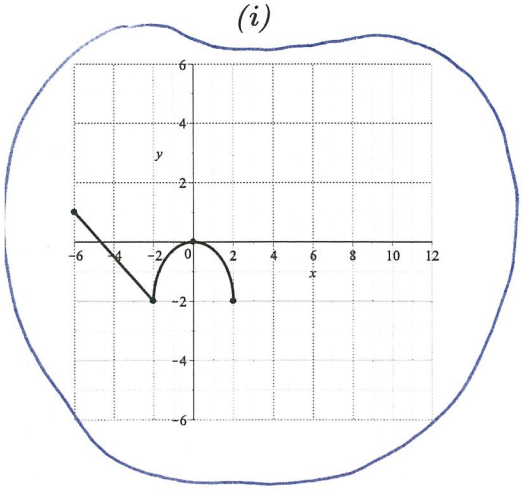


Horizontal ↔ Reflection

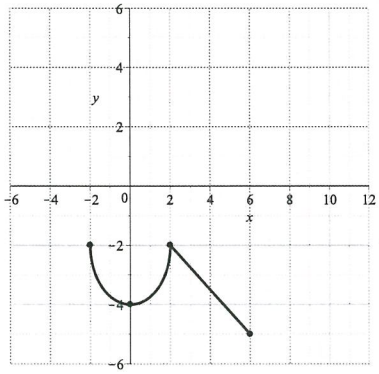
(a). Which of the following is a graph of $y = f(-x) - 2$?

Shift down

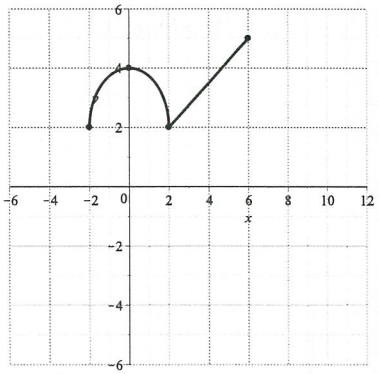
(i)



(ii)



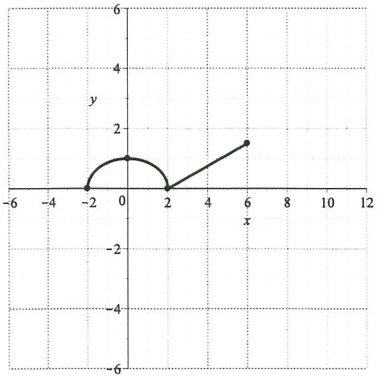
(iii)



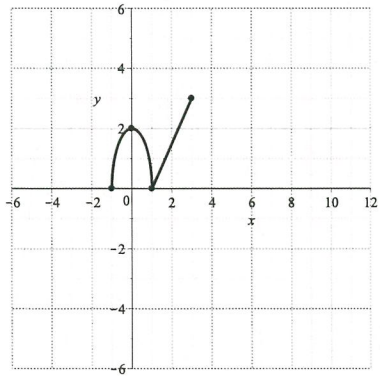
(b). Which of the following is a graph of $y = f\left(\frac{1}{2}x\right)$?

Stretch horizontally by 2.

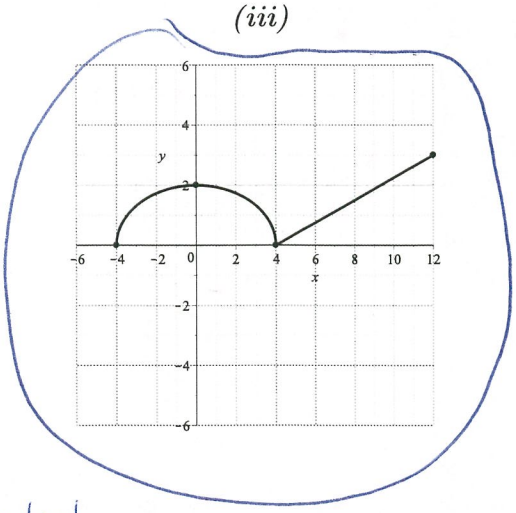
(i)



(ii)



(iii)



Version B Correct graphs are the same, but located as (a) iii and (b) i

8. (6 pts). Given $f(x) = x^4$ and $g(x) = x + 5$, evaluate $(fg)(-2)$.

$$(fg)(-2) = f(-2) \cdot g(-2)$$
$$= (-2)^4 (-2+5)$$
$$= 16(3)$$
$$= \boxed{48}$$

9. (6 pts). Given $f(x) = x - 4$ and $g(x) = x^2 + 3$, find and simplify $f \circ g$.

$$(f \circ g)(x) = f(g(x))$$
$$= f(x^2+3)$$
$$= x^2+3-4$$
$$\boxed{(f \circ g)(x) = x^2 - 1}$$

10. (6 pts). Write the standard form of the equation of a parabola that has vertex $(2, 3)$ and passes through the point $(3, -5)$. Standard form: $f(x) = a(x-h)^2 + k$ (h,k)

(x,y)

$$f(x) = a(x-2)^2 + 3$$
$$-5 = a(3-2)^2 + 3$$
$$-5 = a(1)^2 + 3$$
$$-5 = a + 3$$
$$-8 = a$$

$$\boxed{f(x) = -8(x-2)^2 + 3}$$

11. (12 pts). Given the quadratic function $f(x) = \frac{1}{2}x^2 - 4x + 6$,

[You must show algebraic work to justify your answers.]

(a). Find the vertex point algebraically. [i.e., Use $x = \frac{-b}{2a}$]

$$x = \frac{-b}{2a} = \frac{-(-4)}{2(\frac{1}{2})} = \frac{4}{1} = 4$$

$$f(4) = \frac{1}{2}(4)^2 - 4(4) + 6 = 8 - 16 + 6 = -2$$

Vertex $(4, -2)$

(b). Find the x-intercepts algebraically.

$$\frac{1}{2}x^2 - 4x + 6 = 0$$

$$2 \cdot \left(\frac{1}{2}x^2 - 4x + 6\right) = 2 \cdot 0$$

$$x^2 - 8x + 12 = 0$$

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

$$x - 6 = 0 \quad \text{or} \quad x - 2 = 0$$

$$x = 6, \; 2$$

i.e. pts $(6, 0)$ & $(2, 0)$

12. (10 pts). Given $f(x) = \sqrt{2x+4}$,

(a). Find the inverse function algebraically. [Note: f does pass the Horizontal Line Test.]
[You must show all steps.]

$y = \sqrt{2x+4}$

$x = \sqrt{2y+4}$

$x^2 = 2y+4$

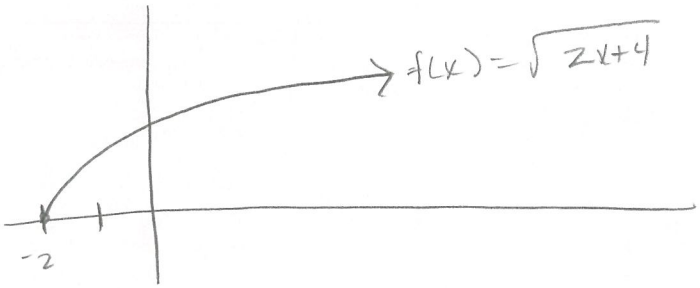
$x^2 - 4 = 2y$

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

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

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

(b). Graph the original function $f(x) = \sqrt{2x+4}$ on your calculator (or by hand).



From the graph, what is the ***range*** of $f(x)$? $y \geq 0$

What is the ***domain*** of the inverse function $f^{-1}(x)$? $x \geq 0$

Interchange $x \leftrightarrow y$