Name: Key
Recitation Instructor:
Recitation Day and Time:

Studio College Algebra – Exam 2 – March 2015

Directions: You will find 16 problems listed below. Each problem is worth 5 points. No notes/books/friends are allowed. Graphing calculator models above the level of a TI-84 plus are not allowed (in particular, calculators with a built in CAS and/or QWERTY keyboard are not allowed). You have one hour to complete this exam. SHOW ALL WORK!

1. Solve $t^2 - 4t - 9 = 0$.

$$t = \frac{4 \pm \sqrt{16 - 4(1)(-9)}}{2(1)}$$

$$= \frac{4 \pm \sqrt{52}}{2} = \frac{4 \pm \sqrt{4 \cdot 13}}{2} = \frac{4 \pm 2\sqrt{13}}{2}$$

$$\boxed{x = 2 \pm \sqrt{13}}$$

2. Write $x^2 + 8x + 3$ in the form $a(x - h)^2 + k$.

$$= x^2 + 8x + 16 - 16 + 3$$
$$= (x+4)^2 - 13.$$

One could use the vertex formula also.

3. A parabola has vertex at $(1, 3)$ and passes through the point $(-1, 8)$. What is the equation of the parabola? Write your answer in the form $y = a(x - h)^2 + k$.

$8 = a(-1-1)^2 + 3$.

$8 = 4a + 3$

$5 = 4a$.

$\frac{5}{4} = a$.

$y = \frac{5}{4}(x-1)^2 + 3$.

4. The height of a ball in the air off the ground in meters, t seconds after it is thrown, is given by the equation $s(t) = -4.9t^2 + 12t + 15$. When does the ball hit the ground?

$0 = -4.9t^2 + 12t + 15$

$t = \frac{-12 \pm \sqrt{12^2 - 4(-4.9)(15)}}{2(-4.9)}$

$t \neq -.911$ or $t = 3.36$.

@ 3.36 seconds.

5. Given $h(x) = 3x - 5$ and $k(x) = x^2 - 3x$, find $k(x) - h(x)$.

$$k(x) - h(x) = x^2 - 3x - (3x - 5)$$
$$= x^2 - 6x + 5$$

(no need to factor)

6. Given $r(x) = 6x - 1$ and $m(x) = x^3 + 2x$, find $r(x)m(x)$.

$$r(x)m(x) = (6x - 1)(x^3 + 2x)$$
$$= 6x^4 + 12x^2 - x^3 - 2x$$

(no need to write in descending power order)

7. Consider the table of values given below for two functions, $f(x)$ and $g(x)$:

x	-2	-1	0	1	2
$f(x)$	-3	1	-2	0	-1
$g(x)$	1	-3	-2	4	5

(a) Using the table above, find $f(1) + g(1)$.

$f(1) + g(1) = 0 + 4 = \boxed{4}$

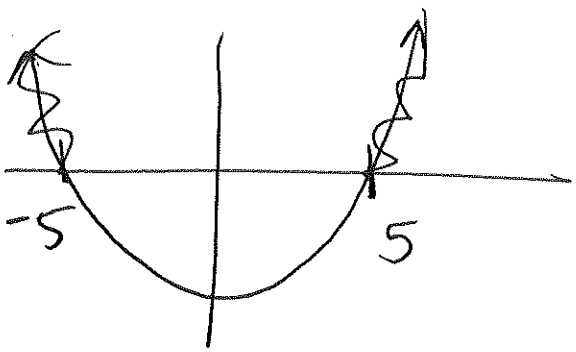
(b) Using the table above, find $f(f(2))$

$f(2) = -1$

$f(f(2)) = f(-1) = \boxed{1}$

8. Solve the quadratic inequality $x^2 - 9 > 16$. (Hint: Use either a graphing or number line method discussed in lecture.)

$x^2 - 25 > 0$



$\boxed{x > 5 \text{ or } x < -5}$

(number line or case analysis is fine also)

9. Given $f(x) = \dfrac{x-5}{x}$, find $f^{-1}(x)$.

$$y = \frac{x-5}{x}$$

$$x = \frac{y-5}{y}$$

$$xy = y - 5$$

$$xy - y = -5$$

$$y(x-1) = -5$$

$$y = \frac{-5}{x-1}$$

$$f^{-1}(x) = \frac{-5}{x-1}$$

10. Solve and check: $x = \sqrt{x+2}$

$$x^2 = x + 2$$

$$x^2 - x - 2 = 0$$

$$(x-2)(x+1) = 0$$

$$x = 2, \; x = -1$$

Check $x = 2$: $2 = \sqrt{4}$ ✓

Check $x = -1$: $-1 \neq \sqrt{1}$

Only $x = 2$.

11. The profit function for selling x units of a certain product is given by $P(x) = -x^2 + 8x - 2$, where $P(x)$ is measured in **thousands**. For what number of units will there be at least \$5000 in profit? *Hint: instead of using the number 5000 as part of your calculations, what number should be used?*

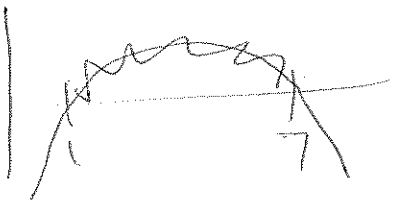
$-x^2+8x-2 > 5$

$-x^2+8x-7 > 0$

$-1(x^2-8x+7) > 0$

$-1(x-7)(x-1) > 0$

$1 \leq x \leq 7$ units



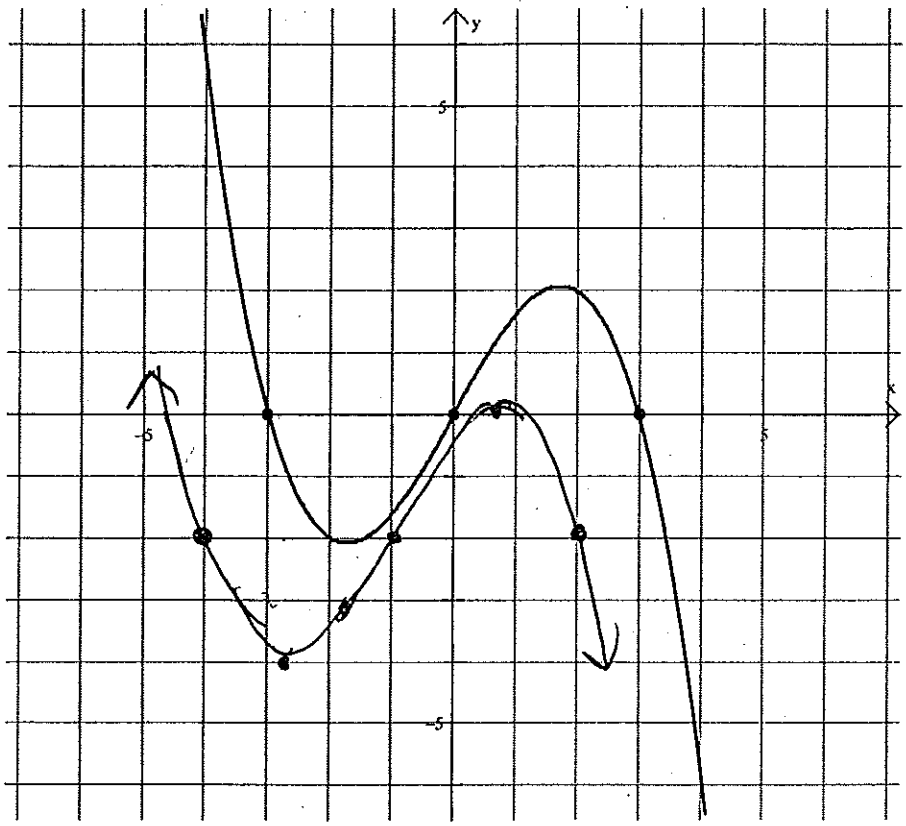
12. A 3-dimensional cartoon portrays an expanding sphere that grows in volume according to the function $V(r) = \frac{4}{3}\pi r^3$, where r is the radius of the sphere, in millimeters. If the radius grows according to the function $r(t) = 2t$, where t is measured in seconds, find and interpret $V(r(2))$.

$r(2) = 4$ ~~seconds~~ millimeters.

$V(r(2)) = V(4) = \frac{256}{3}\pi$ cubic mm.

This is the Volume of sphere @ t=2 seconds

13. Given the graph of $f(x)$ below, graph $f(x+1)-2$.

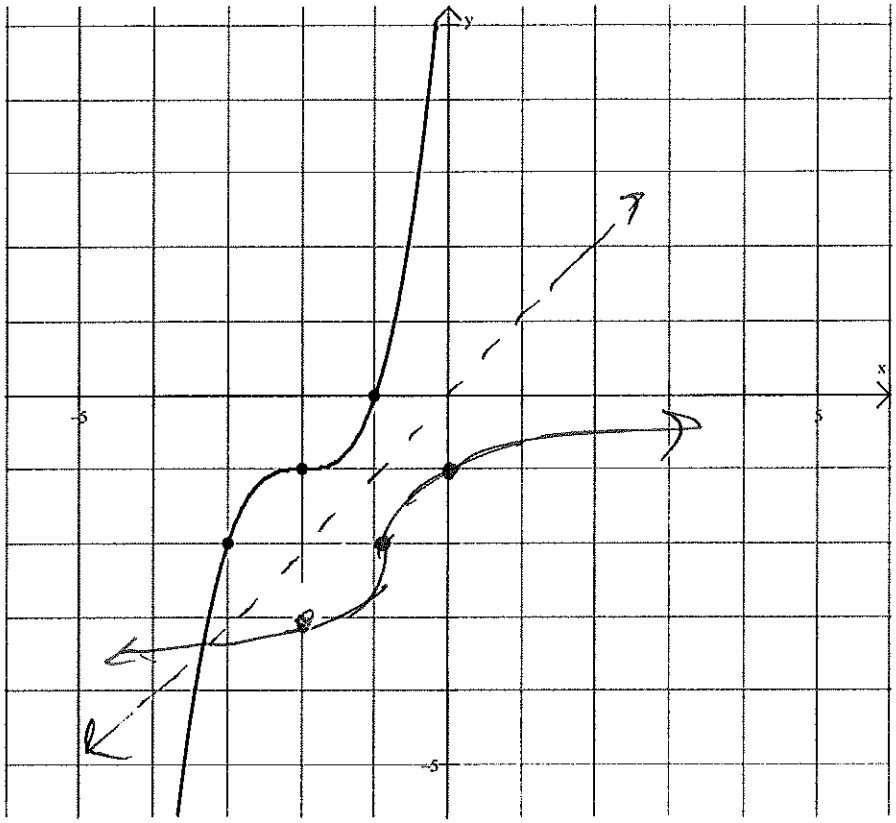


14. Insect resting metabolic rate (RMR) has been found to be scaled positively with body mass (M) according to the equation $RMR = 4.14(M^{0.66})$, where M is measured in mg and RMR is measured in mm^3O_2 per hour. Find the RMR of an insect weighing 1.4 grams.

$4.14(1400^{.66}) =$

$493.679\ mm^3O_2/hr$

15. Consider the graph of $f(x)$ given on the grid below. Sketch $f^{-1}(x)$ on the same grid.



16. Consider the following piecewise function. Write TRUE or FALSE beside each of the statements given below.

$$f(x) = \begin{cases} 6, & x \leq -3 \\ x^4, & -3 < x \leq 2 \\ x, & x > 2 \end{cases}$$

(a) $f(2) = 16$. true
(b) $f(2) = 2$. false
(c) $f(-3) = 6$. true
(d) $f(-3) = -3$. false
(e) $f(-3) = 81$. false