Name:
Recitation Instructor:
Recitation Day and Time:

Studio College Algebra – Exam 2 – March 2016

Directions: You will find 16 problems listed below. SHOW ALL WORK!! 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.

1. Solve $x^2 - 7x - 11 = 0$.

2. Write $x^2 + 16x + 2$ in the form $a(x - h)^2 + k$.

3. A parabola has vertex at $(-2, 4)$ and passes through the point $(1, 6)$. What is the equation of the parabola? Write your answer in the form $y = a(x - h)^2 + k$ (DO NOT MULTIPLY OUT).

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 $s(t) = -4.9t^2 + 12t + 17$. When does the ball hit the ground? (Hint: When the ball hits the ground, what is the distance off the ground? Use this fact, along with the quadratic formula.)

5. Given $h(x) = 5x - 4$ and $k(x) = x^2 - 9x$, find $k(x) - h(x)$.

6. Given $r(x) = 3x + 1$ and $m(x) = x^3 - 7x$, find $r(x)m(x)$.

7. Consider the functions, $f(x) = 8$ and $g(x) = x + 3$:

   (a) Using the functions above, find $f(2) + g(2)$.

   (b) Using the functions above, find $f(g(f(1)))$.

8. Solve the quadratic inequality $x^2 - 3 < 13$. (Hint: Use either a graphing or number line method discussed in lecture.)

9. Given $f(x) = \dfrac{x-8}{x}$, find $f^{-1}(x)$.

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

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?*

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 $r(t) = 3t$, where t is measured in seconds, find and interpret $V(r(2))$.

13. Given the graph of $f(x)$ below, graph $f(x-3) - 1$.
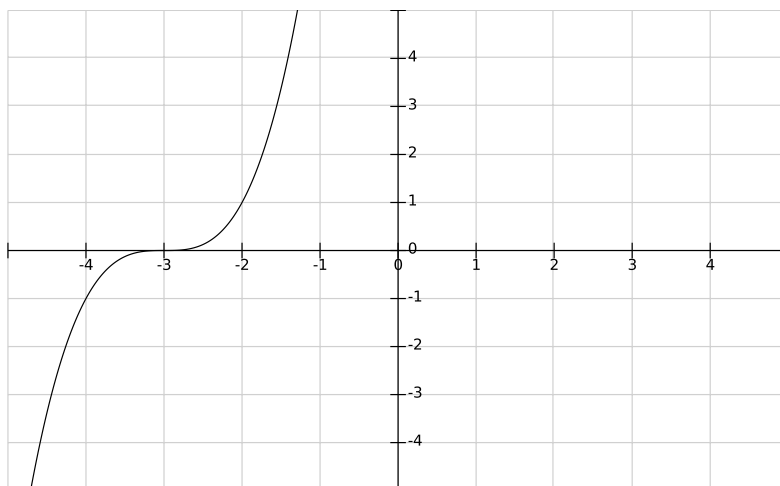
14. Insect resting metabolic rate (RMR) has been found to be scaled positively with body mass (M) according to the equation $RMR = 4.14(M^{0.66})$, where M is measured in mg and RMR is measured in $mm^3 O_2$ per hour. Find the RMR of an insect weighing 3.2 grams.

15. Consider the function whose input value is time of day and whose corresponding output value is temperature at that time of day, rounded to the nearest degree. Is this a one-to-one function? Explain.

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

$$f(x) = \begin{cases} 5, & x \leq -3 \\ x^3, & -3 < x \leq 2 \\ -x, & x > 2 \end{cases}$$

(a) $f(2) = 8$.

(b) $f(2) = -2$.

(c) $f(-3) = 5$.

(d) $f(-3) = 125$.

(e) $f(-3) = 3$.