Name:
Recitation Instructor:
Recitation Day and Time:

Studio College Algebra – Exam 2 – October 2019

Directions: You will find 16 problems listed below. SHOW ALL WORK!! Each problem is worth 5 points. No notes/books 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 $(x-2)^2 - 35 = 0$.

2. Write $x^2 + 14x - 5$ in the form $a(x-h)^2 + k$.

3. A parabola has vertex at $(-2, 5)$ and passes through the point $(1, 7)$. 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 $s(t) = -4.9t^2 + 52t + 120$. WHEN does the ball reach its maximum height? Include appropriate units on your answer.)

5. Consider the functions, $f(x) = x + 2$ and $g(x) = 25$:

   (a) Using the functions above, find $f(f(3))$.

   (b) Using the functions above, find $g(g(g(15)))$.

6. Solve the quadratic inequality $x^2 - 3 > 6$.

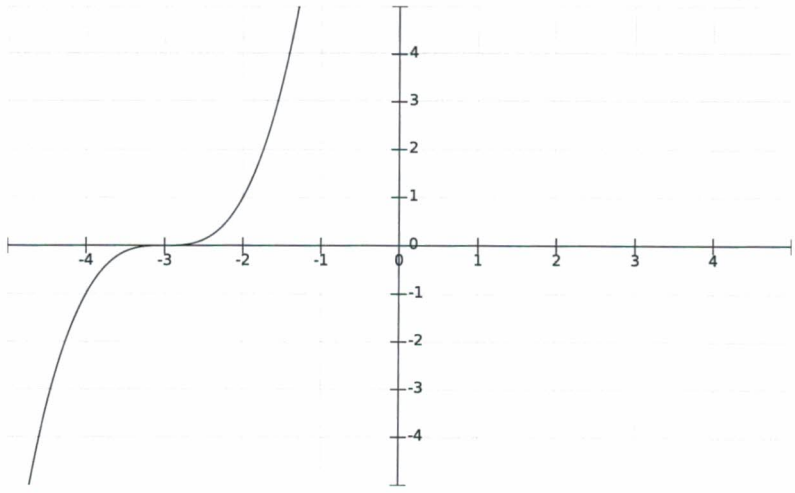
7. Given $f(x) = \dfrac{7+x}{x}$, find $f^{-1}(x)$.

8. Solve and check: $x + 1 = \sqrt{3x + 7}$

9. 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?*

10. 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 $V(r(1))$.

11. Given the graph of $f(x)$ below, graph $f(x-1)-1$.



12. 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 1.7 grams.

13. (a) Write down an example of a linear function that is a one to one function. USE FUNCTION NOTATION.

(b) Write down an example of a linear function that is NOT one to one. USE FUNCTION NOTATION.

14. Write up a piecewise linear function, $C(x)$, that describes the total monthly cost of water usage based on the table below. Here, x is the number of gallons used.

Monthly Usage (in gallons)	**Monthly Charge**
0-200	\$8, plus \$0.05 per gallon
More than 200, up to 500	\$20, plus \$0.07 for every gallon over 200
More than 500, up to 800	\$42, plus \$0.09 for every gallon over 500

15. Given $f(x) = x + 1$ and $g(x) = \dfrac{1}{x}$, find $(f \circ g)(x)$ and SIMPLIFY COMPLETELY, writing your answer as a single fraction.

16. Given $f(x) = x + 1$ and $g(x) = \dfrac{1}{x}$, find $(g \circ f)(x)$.

17. BONUS (worth 2 points): Given $f(x) = x + 1$ and $g(x) = \dfrac{1}{x}$, find $(g \circ f)(x) - (f \circ g)(x)$ and simplify completely, writing your answer as a single fraction. No partial credit awarded on this problem.