Name:
Recitation Instructor:
Recitation Day and Time:

Studio College Algebra – Final Exam – Spring 2019

Directions: You will find 28 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. Consider $g(x) = |2x + 3| - 6$. Answer the following:

   (a) Find $g(-3)$.

   (b) Find $g(-1)$.

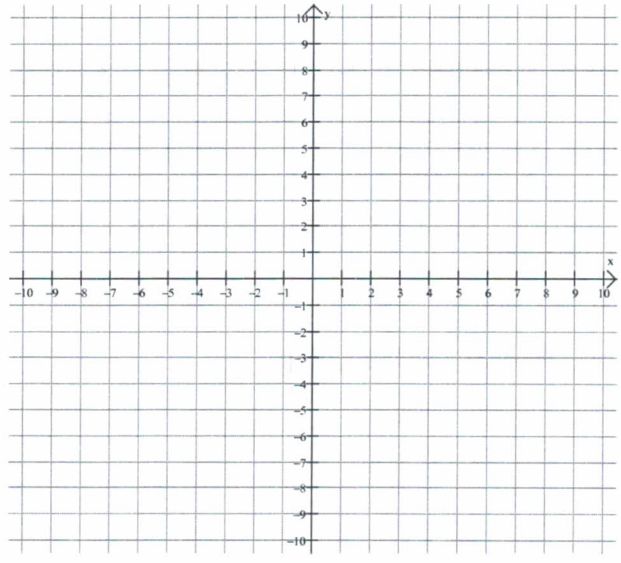
   (c) Find $g(0)$.

   (d) Find $g(2)$.

   (e) Find $g(4)$.

2. Solve for x in the equation $6(2x - 1) + 4 = 3x - 8$.

3. Graph $4x + y = 1$ on the grid below. Include all intercepts.



4. Solve $|x - 7| = 3$ and check your answers.

5. A truck depreciates in value according to a linear model. If the initial value of the truck is \$36,000, and the value sixty years later is \$0, find a linear function that describes the value of the truck after t years.

6. Suppose a line passes through (5,9) and (0,9). What is the slope of the line passing through these points?

7. What is the domain of the function $f(x) = \dfrac{3}{20 + 6x}$?

8. Solve $3x^2 + x - 11 = 0$.

9. Given $r(x) = 2x + 5$ and $m(x) = 10x^3 - 3x$, find $r(x)m(x)$.

10. Consider the functions, $f(x) = x - 1$ and $g(x) = 3x^2$:

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

    (b) Using the functions above, find $g(g(g(2)))$.

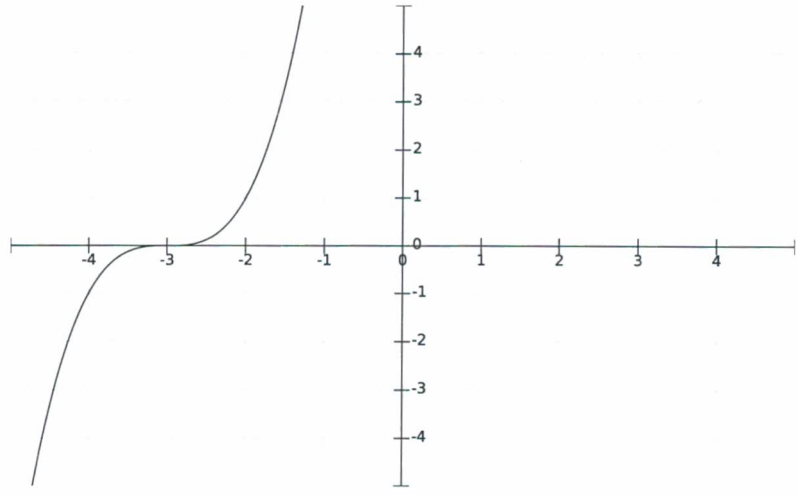
11. Solve the quadratic inequality $x^2 > 0$.

12. Given $f(x) = 6x + 5$, find $f^{-1}(x)$.

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

14. The height of a ball in the air off the ground in meters, t seconds after it is thrown, is given by the equation $s(t) = -4.9t^2 + 12t + 16$. Roughly over what time interval(s) is the ball at most 18 meters off the ground?

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



16. 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 150 mg.

17. Approximately what lump sum would need to be invested at an annual interest rate of 1%, under continuous compounding, for 4 years, in order to end up with \$6000? Round answer to the nearest cent. The formula you want to use is $P(t) = P_0 e^{rt}$.

18. Solve $2^{(x+3)} = 6$. Leave answer exact, i.e., do not use calculator.

19. Solve $5\ln(x+1) - 2 = 18$. Leave answer exact, i.e., do not use calculator.

20. The function $P(t) = 21.109 - 5.686\ln(t+1)$ describes the revenue, in thousands of dollars, for the sale of a product t weeks after an ad campaign for the product ended, where $0 \leq t \leq 10$. Find $P(3)$, round to the nearest cent, and interpret the meaning of $P(3)$ in a complete sentence.

21. What are all the real and complex zeros of $x^3 - 125$, given that one zero is $x = 5$?

22. Consider the rational function $r(x) = \dfrac{(2x + 15)(x + 7)}{x^2 - 7x + 12}$.

(a) Find the vertical asymptotes of $r(x)$.

(b) Find the horizontal asymptote of $r(x)$.

(c) Find the zeros of $r(x)$.

(d) Find the y-intercept of $r(x)$.

23. (8 points) Set up a system and solve the following problem. Light roast coffee beans cost \$4.00/lb, medium roast coffee beans costs \$1.00/lb, and dark roast coffee beans cost \$4.50/lb. If there is twice as much medium roast as there is of the light roast, how much of each type of coffee is needed to create 5 pounds of a mixture that costs \$3.50 per pound? Be sure to indicate the meaning of any variables used in setting up this problem.

24. Using any method you like (except the calculator method), solve the following system.

$$x + 2y = 9$$
$$2x + 3y = 5$$

25. Suppose A is a 2x4 matrix, B is a 4x3 matrix, and C is a 3x3 matrix. Also, assume that all these matrices have real valued entries. Beside each of the following, write down the size of the resulting matrix. If undefined, write down 'undefined.'

(a) AB

(b) A-B

(c) $(AB)(BC)$

(d) CB

(e) C^2

26. Let I_3 denote the 3x3 identity matrix. Find $(4I_3 + 3I_3)(2I_3)$.

27. Solve the following rational equation: $\dfrac{6}{x+1} = \dfrac{2}{3x-1}$

28. Find the inverse of the following matrix:

$$\begin{pmatrix} 8 & 5 \\ -4 & -3 \end{pmatrix}$$