Name:
Recitation Instructor:
Recitation Day and Time:

Studio College Algebra – Final Exam – December 2018

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. Suppose a line passes through (-2,-3) and (5,5). Find the equation of this line.

2. A vehicle depreciates in value linearly. If the initial value of the vehicle is $\$10000$, and the value 8 years later is $\$6000$, find a linear function that gives the value of the car after t years.

3. Solve $2x - 1 = |x + 3|$ and check your answers.

4. Solve $|4x - 1| > 8$.

5. Given the function $C(x) = 12x + 6000$, which describes the total cost, in dollars, of producing x digital photo frames, answer the following questions.

   (a) What is the domain of $C(x)$ in context of the situation?

   (b) Find and interpret $C(20)$.

6. Consider the linear function $f(x) = 3(x - 2) - 4$. Answer the questions that follow.

   (a) What is the slope of $f(x)$?

   (b) What is the y-intercept of $f(x)$?

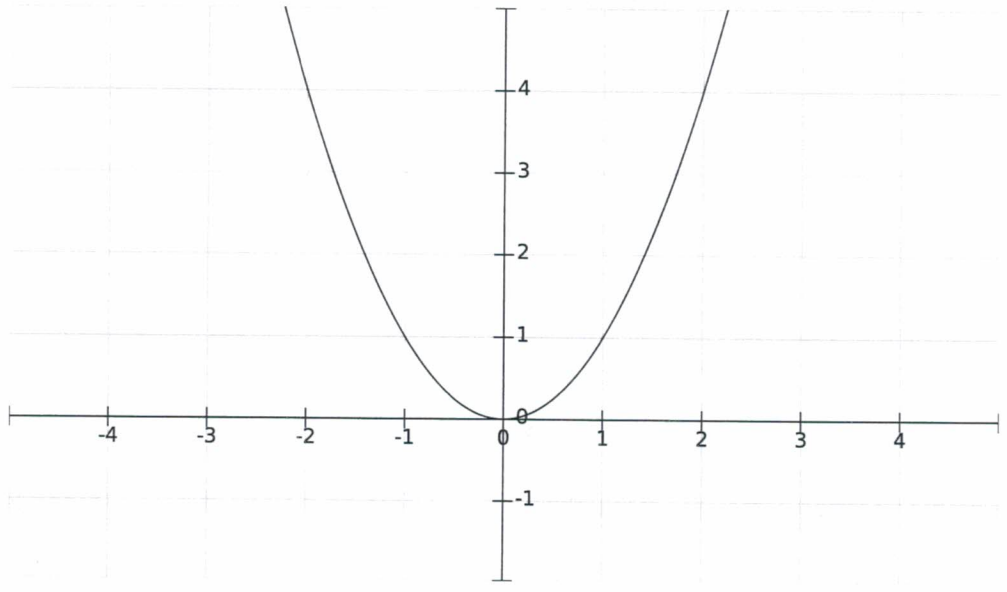
   (c) Solve $f(x) = 0$.

7. In a controlled lab environment, some organisms exhibit constant growth over a specific time period. Suppose a certain organism starts out weighing 0.4 mg, and grows to 1.6 mg over a 24 hour time period. Find a linear model that describes the growth of the organism for $0 \leq t \leq 24$ hours.

8. Solve the quadratic inequality $x^2 - 9 < 0$. (Hint: Use either a number line, graph, or case analysis to explain your reasoning.)

9. Given $f(x) = \log_4(x+1)$, find $f^{-1}(x)$.

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



11. Solve $x^2 - 6x - 3 = 8$.

12. A dolphin jumps out of the water, and its height in feet above the surface of the water after t seconds is given by the function $H(t) = -.122(t - 6.4)^2 + 5$. Answer the following:

(a) Find (h, k), the vertex of this function.

(b) Fill in the blanks with the appropriate number values:

"This dolphin reaches a maximum height of _____ feet at a time of _____ seconds."

13. Given $h(x) = x + 2$ and $r(x) = x^2 - 7$, find $r(h(r(x)))$ and expand answer completely.

14. Solve and check: $2 + x = \sqrt{8x + 1}$

15. If $\log(a) = 2.8$ and $\log(b) = 4.8$, find $\log\left(\frac{a^3}{b}\right)$.

16. Approximately what lump sum would need to be invested at an annual interest rate of 1.5%, under monthly compounding, for 12 years, in order to end up with \$10,000? Round answer to the nearest cent.

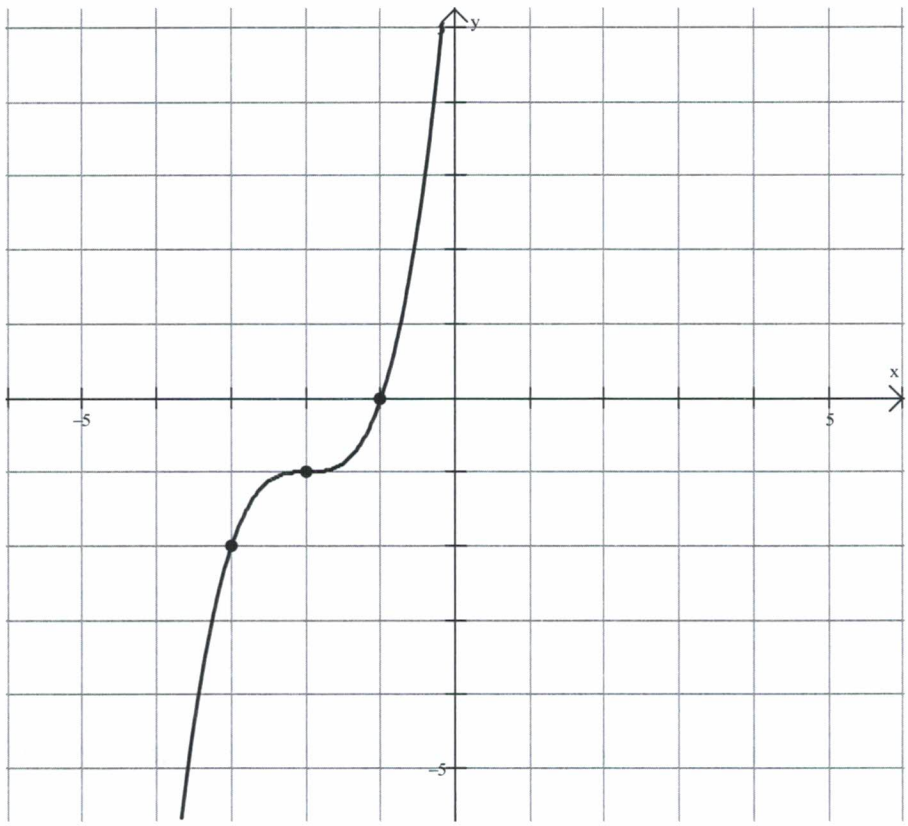
17. Solve $3\ln(4x+1)-3=12$. Leave answer exact, i.e., do not use calculator.

18. Find the domain of $f(x)=\ln(5x+11)$.

19. Find a 3rd degree polynomial that has zeros at $x = 2$, $x = 0$ and $x = 1$, that also passes through the point $(-1, 5)$.

20. Find all the zeros of $R(x) = 16x^3 + 8x^2 + x$.

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



22. Consider the rational function $r(x) = \dfrac{2-x}{x^2-9x+18}$.

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

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

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

23. Light roast coffee beans cost \$6.00/lb, while dark roast ones cost \$5.00/lb. How much of each type of coffee is needed to create 8 pounds of a mixture that costs \$5.20 per pound?

24. State the formula for finding the inverse of a 2x2 matrix. Then, find the inverse of the following matrix.

$$\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$$

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25. Suppose A is a 5x4 matrix, B is a 3x4 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) $5A$

(b) $A+B$

(c) AB

(d) CB

(e) $4B$

26. Find the domain of $r(x) = \dfrac{3}{x^2 - 16}$.

27. Solve the following rational equation: $\dfrac{3}{x+2} = \dfrac{7}{2x-1}$.

28. Solve the following system completely by hand (in other words, do not use a calculator).

$$\begin{aligned} x + 2y &= 3 \\ 3x + 4y &= -4 \end{aligned}$$