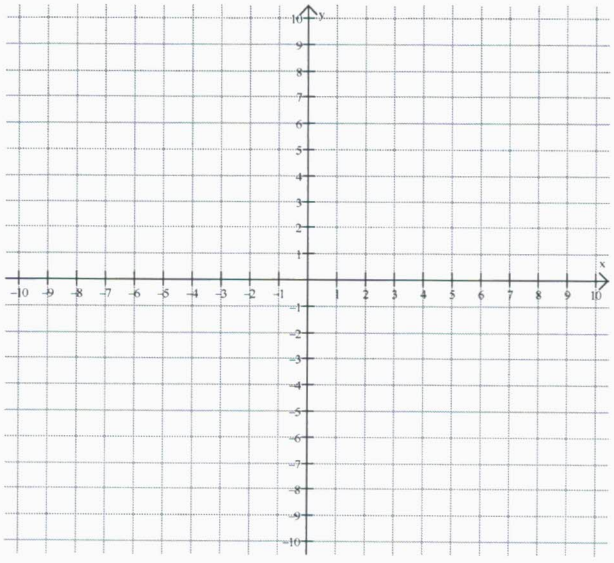
Name:
Recitation Instructor:
Recitation Day and Time:

Studio College Algebra – Final Exam – December 2016

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. Graph $4x - 2y = 6$ on the grid below. Include all intercepts.



2. A line L passes through the points $(2, 5)$ and $(4, b)$ where b is some real number.

   (a) For what value of b does the line L have zero slope?

   (b) For what value of b does the line L have a slope of 3?

3. Solve $3x - 7 = |2x + 5|$ and check your answers.

4. Solve $|6x - 11| < 9$.

5. Suppose the cost function in U.S. dollars for x units of a certain product is given by $C(x) = 4x+4000$, and similarly, the revenue function for the product is given by $R(x) = 22x-4000$. How many units must be sold to earn $28,000 in profit?

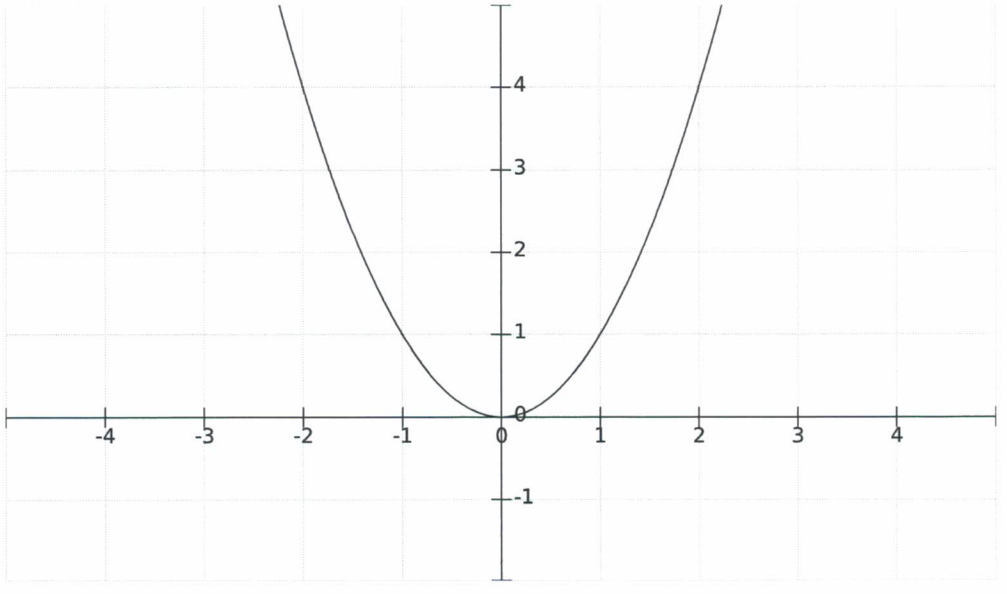
6. (6 points) In a controlled lab environment, some organisms exhibit constant growth over a specific time period. Suppose a certain organism starts out weighing 2 mg, and grows to 8 mg over a 24 hour time period. Find an equation in either slope intercept form or point slope form that describes the growth of the organism for $0 \leq t \leq 24$ hours. (Hint: Convert the given information into ordered pairs).

7. The weekly profit function for a business is $P(x) = 80x - 500$, where x is the number of customers. How many more customers must the business add if it wants to increase profits by \$3200 per week?(Hint: Marginal profit)

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

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



11. Solve $t^2 - 5t - 1 = 14$.

12. The height of a projectile in the air off the ground in meters, t seconds after it is thrown, is given by the equation $s(t) = -4.9t^2 + 12t + 120$. When does the ball reach a maximum height?

13. Given $h(x) = e^x + 1$ and $k(x) = \ln(x - 2)$, find $k(h(x))$ and $h(k(x))$.

14. Solve and check: $8 - x = \sqrt{x + 4}$

15. If $\log(a) = 1.6$ and $\log(b) = 2.8$, find $\log(a^3b^2)$.

16. Approximately what lump sum would need to be invested at an annual interest rate of 1.5%, under daily compounding, for 5 years, in order to end up with \$3400? Round answer to the nearest cent.

17. Solve $4\ln(2x-5)+1=29$. Leave answer exact, i.e., do not use calculator.

18. Find the domain of $f(x)=\ln(60035+1197x)$.

19. Find 2 different fourth degree polynomials, each having single roots at $x = 1$, $x = 2$ and a double root at $x = -52$. Do not multiply your answers out.

Answer 1:

Answer 2:

20. Given that $x = -9$ is a zero of the polynomial $p(x) = x^3 + 729$, find all the other zeros, real or complex, of $p(x)$.

21. For each of the following exponential functions, write down if the function represents 'growth' or 'decay.'

(a) $y = 1.5^{-x}$

(b) $y = 5^{x}$

(c) $y = \left(\frac{3}{4}\right)^{-x}$

(d) $y = \left(\frac{1}{7}\right)^{-2x}$

(e) $y = \left(\frac{5}{3}\right)^{-x}$

22. Consider the rational function $r(x) = \dfrac{(7x+1)(x-3)}{x^2 - 8x + 7}$.

(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 \$7.00/lb, while dark roast ones cost \$5.50/lb. How much of each type of coffee is needed to create 4.50 pounds of a mixture that costs \$6.75 per pound?

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

$$\begin{aligned} 2x + 3y &= 4 \\ 5x - 3y &= 1 \end{aligned}$$

25. Suppose A is a 3x4 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) $2A$

(b) $A+B$

(c) AB

(d) BA

(e) $6B$

26. Let I_3 denote the 3x3 identity matrix. Find $(4I_3 + 7I_3)(5I_3)$.

27. Solve the following rational equation: $\dfrac{1}{4x+7} = \dfrac{8}{2x+4}$.

28. Is it possible to find the inverse of the following matrix? Why or why not? Briefly explain.

$$\begin{pmatrix} 12 & -6 \\ 8 & 4 \end{pmatrix}$$

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