Math 1090 Final Exam
Fall, 2011

Name _____

Instructor:

<u>Instructions</u>:

❏ Show all work, as partial credit will be given where appropriate.

❏ If no work is shown, there may be no credit given.

❏ All final answers should be written in the space provided on the exam and in simplified form.

❏ You may use a scientific calculator, but no cell phone, graphing or programmable calculators are allowed!!

❏ You may NOT ask questions during the exam. If you think there is an error on the exam, just write a note on that problem indicating your concern.

DO <u>NOT</u> WRITE IN THIS TABLE!!!
(It is for grading purposes.)

Grade:

1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Raw Total (out of 100 points)

Total (percentage)

1. (8 points) Write down the equation of the line that passes through the point $(2, 0)$ and is perpendicular to the line $y = -\frac{2}{3}x + 1$. Put your answer in slope-intercept form.

Line: _____

2. Fred makes a $600 contribution to a retirement account at the end of each quarter. He does this for 15 years. The account earns 6.4% annual interest, compounded quarterly.

   (a) (5 points) How much money is in the account after the 15 years of contributions?

   Answer: _____

   (b) (5 points) After the first 15 years, he makes no additional contributions and no withdrawals, and he leaves the money in the account for another 10 years. How much money is in the account at the end of those next 10 years? (Assume quarterly compounding, as in part (a).)

   Answer: _____

3. Vera sells fancy chairs. Her fixed costs are $720 and it costs $90 to make each chair. Her revenue function is given by $R(x) = -x^2 + 166x$.

(a) (3 points) What is her profit function?

Profit Function: _____

(b) (3 points) How many chairs must Vera sell to maximize profit?

Number of chairs: _____

(c) (3 points) What is her maximum profit?

Maximum profit: _____

(d) (3 points) How many chairs must she sell to break even?

Number of chairs to break even: _____

4. (10 points) Solve the following system of equations.

$$
\begin{aligned}
2x \quad\;\;\; - z &= 5 \\
3x + 2y + z &= 8 \\
x + y + z &= 2
\end{aligned}
$$

Solution: _____

5. Solve the following equations.

(a) (4 points) $\log_4(x + 2) - \log_4 5 = \log_4 20$

$x =$ _____

(b) (4 points) $2e^{5t} - 5 = 1$

$t =$ _____

(c) (4 points) $\dfrac{2}{x + 2} + 1 = \dfrac{5}{x - 2}$

$x =$ _____

6. A shopkeeper sells cashews and almonds. Both cashews and almonds each cost him $30 per pound. He earns a profit of $10 per pound on cashews and $20 per pound of almonds. He can spend at most $1,500 to buy all the nuts. Also, he wants to earn a total profit of at least $600. Let the amount of cashews sold be x and the amount of almonds sold be y. Assume the shopkeeper sells everything he buys.

   (a) (5 points) Write down the inequalities that describe your constraints on the number of cashews and almonds he should sell to meet his requirements.

   _____

   _____

   _____

   _____

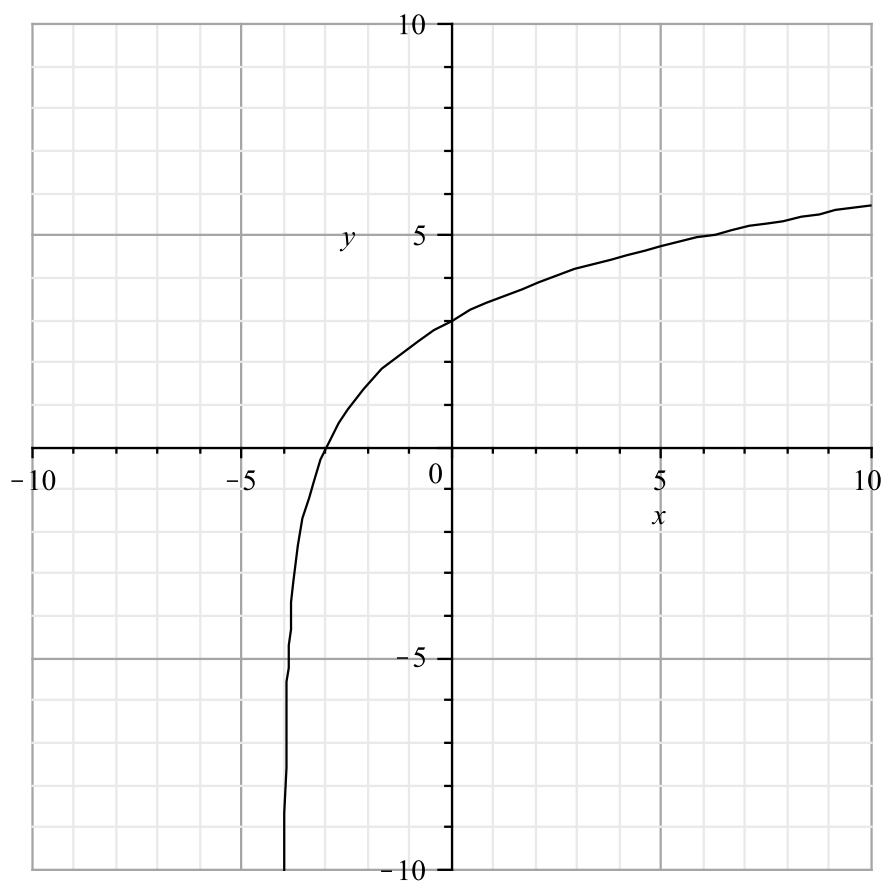   (b) (5 points) Graph these inequalities, label the axes, shade in the feasibility region, and label the vertices.
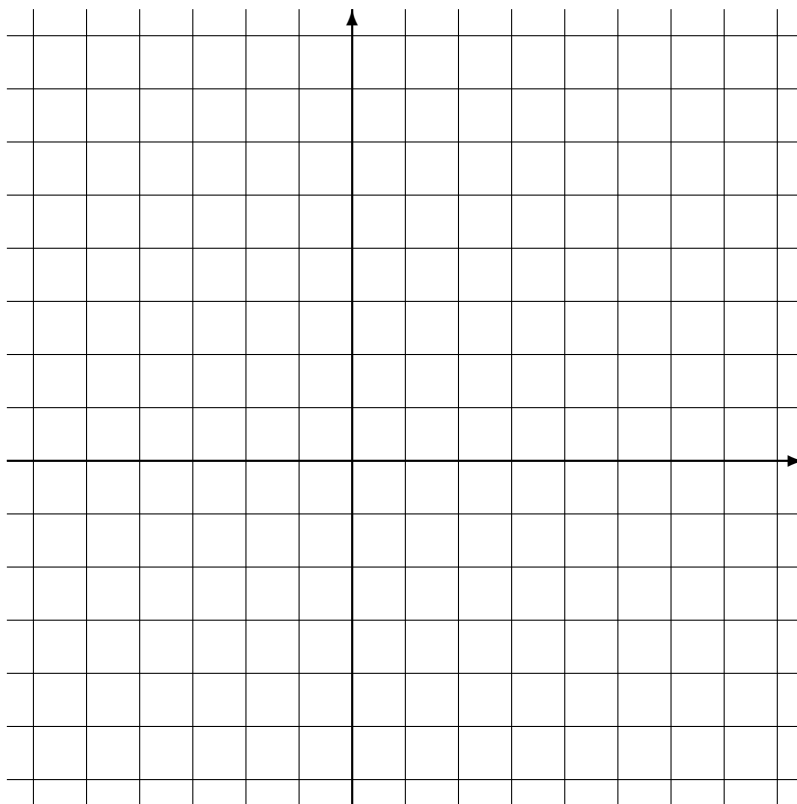
7. Given this original function $f(x) = \frac{3}{2}\log_2(x+4)$:

(a) (4 points) Compute the inverse function $f^{-1}(x)$

$$f^{-1}(x) = \underline{\hspace{4in}}$$

(b) (4 points) The graph of the original function is drawn below. On these same axes, sketch the graph of the inverse function you found in part (a).

8. Let $A = \begin{bmatrix} 1 & 2 & -2 \\ 3 & -1 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 3 & -2 \\ -1 & 4 & 2 \end{bmatrix}$, $C = \begin{bmatrix} 4 & -2 \\ 0 & -3 \\ -1 & 1 \end{bmatrix}$. Compute the following, or explain why it is not possible.

(a) (3 points) $A - 3B =$ _____

(b) (3 points) $B^{\mathrm{T}} - C =$ _____

(c) (2 points) $AB =$ _____

(d) (3 points) $CA =$ _____

9

9. Let $f(x) = x^2$, $g(x) = 2x - 1$, $h(x) = \dfrac{4}{x+7}$. Find the following.

(a) (2 points) Domain of $h(x)$: _____

(b) (3 points) $(hf)(1) =$ _____

(c) (2 points) $(f \circ g)(x) =$ _____

(d) (3 points) $h(-6) + g(2) + 5 =$ _____

10

10. Suppose you buy a house for $300,000. You put 20% down so your loan amount is $240,000. It is a 30 year amortized loan at the fixed annual interest rate of 5.25%.

    (a) (5 points) What is your monthly payment amount?

Monthly payment: _____

    (b) (4 points) Not including the down payment, how much will you pay over the life of the loan?

Total: _____