

**Math 111**  
**Final Exam**  
**Spring 2011**

Name: \_\_\_\_\_

1. Your exam contains 9 questions and 7 pages; Please make sure you have a complete exam.
2. The entire exam is worth 100 points. Point values vary and these are indicated on each problem. You have 1 hour and 50 minutes for this exam.
3. Make sure to ALWAYS SHOW YOUR WORK; you will not receive any partial credit unless all work is clearly shown. If in doubt, ask for clarification.
4. You may use a calculator, but I will not give credit for work done solely on a calculator (aside from arithmetic).
5. Leave answers in exact form (as simplified as possible).
6. Put a box around your final answer where applicable.
7. If you need extra space, attach a sheet to the back of the exam and clearly indicate this.
8. Be sure to **check your answers!**
9. In case you need it, here are the formula for annuities:

Savings (Future Value):

$$S = R \left[ \frac{(1 + \frac{r}{k})^{kt} - 1}{\frac{r}{k}} \right]$$

Loan Payment (Present Value):

$$P = R \left[ \frac{1 - (1 + \frac{r}{k})^{-kt}}{\frac{r}{k}} \right]$$

Problem	Total Points	Score
1	7	
2	7	
3	18	
4	20	
5	9	
6	6	
7	16	
8	11	
9	6	
Total	100	

1. (7 pts.) Find an equation of a line that goes through the points  $(4, -7)$  and  $(-6, -2)$ .

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2. (7 pts.) Solve the following equation:  $\sqrt{6x - 9} = x$

3. (18 pts.) For parts (a)-(d), consider the following quadratic function that gives the cost (in thousands of dollars) for a small company to produce  $x$  items:  $C(x) = 2x^2 - 60x + 500$

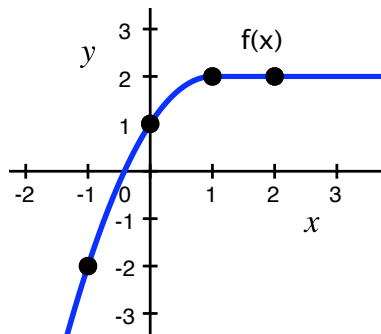
(a) (6 pts.) Find  $C(5)$  and interpret/explain the result in terms of costs and number of items produced.

(b) (4 pts.) Find the vertex of  $C(x)$ .

(c) (3 pts.) Find the range of  $C(x)$ .

(d) (5 pts.) Simplify the quantity  $\frac{C(x+h)-C(x)}{h}$ .

4. (20 pts.) Consider the two following functions  $f(x)$  and  $g(x)$  as given below for parts (a)-(e).



(a) (3 pts.) Assuming  $g(x)$  has an inverse, find the value of  $g^{-1}(2)$ .

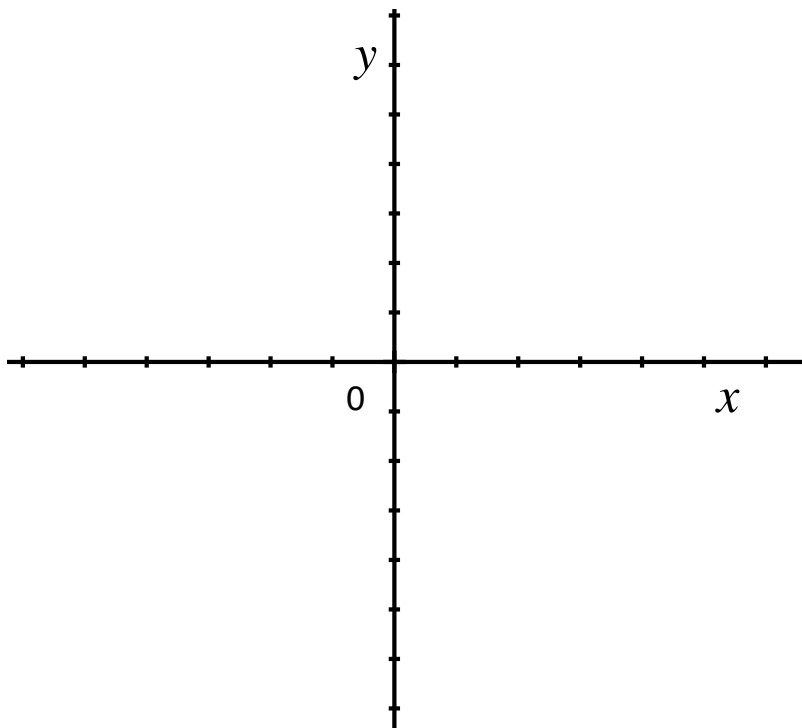
(b) (5 pts.) Find the average rate of change of  $g(x)$  between  $x = -1$  and  $x = 2$ .

(c) (4 pts.) Find the value of  $g(f(1))$ .

(d) (5 pts.) Find a formula, in terms of the function  $f$ , for a new function created if  $f(x)$  is vertically stretched by 7, reflected over the  $x$ -axis, and shifted to the right by 3.

(e) (3 pts.) Find the value of  $h(0)$  if  $h(x) = 2f(x) - g(x)$ .

5. (9 pts.) Graph the function  $h(x) = \begin{cases} 2 & , \text{for } x < -1 \\ x^3 - 3x^2 + 2x & , \text{for } x \geq -1 \end{cases}$ . Be sure to include a scale.



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6. (6 pts.) Find the domains of the functions  $F(x) = \sqrt[4]{3x+6}$  and  $G(x) = e^{x-1}$ .

7. (16 pts.) Use the following rational function in parts (a)-(c) below:  $H(x) = \frac{2x^2-10}{x^2+3x}$

(a) (7 pts.) Find the  $x$ -coordinate of the points of  $H(x)$  with a  $y$ -coordinate of  $-2$ .

(b) (5 pts.) Find the  $x$ -intercept(s) and  $y$ -intercept(s) of  $H(x)$ . (if any)

(c) (4 pts.) Write equations for the horizontal and vertical asymptotes of  $H(x)$  (if any).

8. (11 pts.) Suppose you have a savings account that gives 15% compounded monthly in which you initially invested \$2,000 once.

(a) (3 pts.) Find the effective rate of the account.

(b) (8 pts.) How many years will it take for there to be \$5000 in the account?

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9. (6 pts.) Suppose you want to buy a car, but you can only afford to spend \$350 each month on a loan. If you have \$3000 for a down payment and you can get a 5-year car loan at 3% compounded monthly, what is the most expensive car you can get?

$x$	$-1$	$0$	$1$	$2$
$g(x)$	$3$	$2$	$0$	$-1$