

Math 111
Final Exam
December 7th, 2007

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 2 hours for this exam.
3. Make sure to ALWAYS SHOW YOUR WORK; you will not receive full credit unless all work is clearly shown. If in doubt, ask for clarification.
4. If you need extra space, use the back of the exam and clearly indicate this.
5. You are allowed one 8.5×11 sheet of handwritten notes (both sides). Graphing and scientific calculators are allowed.
6. Leave answers in exact form (as simplified as possible) or round to 4 decimal places. Monetary values can be rounded to 2 decimal places.

| Problem | Total Points | Score |
|---------|--------------|-------|
| 1 | 10 | |
| 2 | 12 | |
| 3 | 12 | |
| 4 | 17 | |
| 5 | 8 | |
| 6 | 9 | |
| 7 | 12 | |
| 8 | 8 | |
| 9 | 12 | |
| Total | 100 | |

1. (10 pts.) You decide to sell “I ♥ Linear Functions” t-shirts. In order to make the t-shirts, you have to first buy a machine that will cost \$12,000. After that, it will cost you \$8.50 (supplies and labor) to make each t-shirt.

(a) (7 pts.) Write a formula for the function $TC(q)$, which gives the total cost of producing q t-shirts.

(b) (3 pts.) How many t-shirts can you make if you have \$16,675?

2. (12 pts.) Solve the following equations.

(a) (6 pts.) $10^{4x+2} = 500(400)^x$ (Give the exact answer.)

#2 Continued:

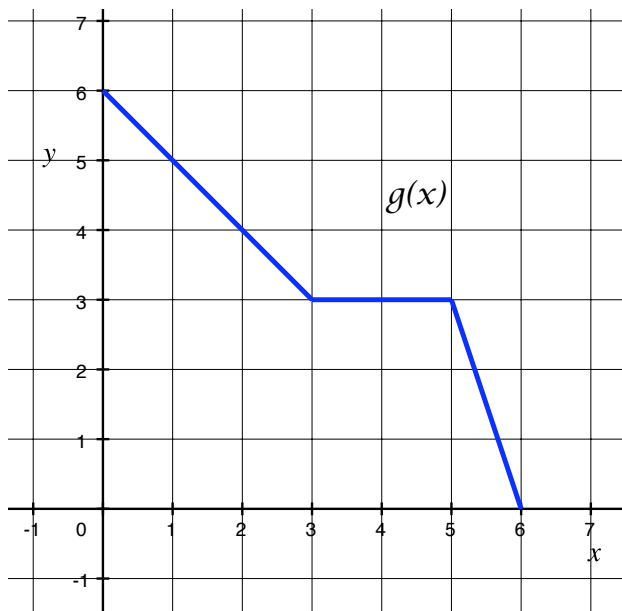
(b) (6 pts.) $t^{-1} = 16t$.

3. (12 pts.) You are tracking the population of rabbits on an island. At time 0, there are 2000 rabbits. After 3 years, there are 8192 rabbits.

(a) (9 pts.) Assuming that the population grows exponentially, find a formula $P(t)$ for the population of rabbits at time t years.

(b) (3 pts.) What is the percentage change of the population each year?

4. (17 pts.) Let $f(x) = 2x^2 - 4$ and the graph of $g(x)$ be shown below.

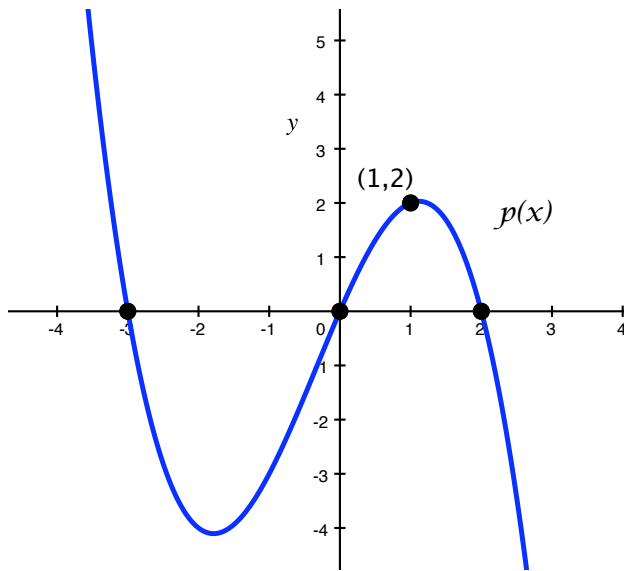


(a) (6 pts.) Find $f(g(4))$ and $g(g(2))$.

(b) (7 pts.) Write a simplified formula for $2f(x-5)+3$ and describe the effect of the transformations on $f(x)$.

(c) (4 pts.) Find $f(1) \cdot g(1) + 2f(1)$.

5. (8 pts.) Write a possible equation for the function $p(x)$ shown in the graph below. (You do **not** need to simplify your answer.)



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6. (9 pts.) What is the domain of each of the following functions?

(a) (3 pts.) $f(t) = \ln(t + 3)$

(b) (3 pts.) $g(x) = 4e^{2-x}$

(c) (3 pts.) $h(x) = \frac{1}{\sqrt{x-5}}$

7. (12 pts.) Consider the rational function $g(x) = \frac{2x^3+4x^2-6x}{x^3-1}$.

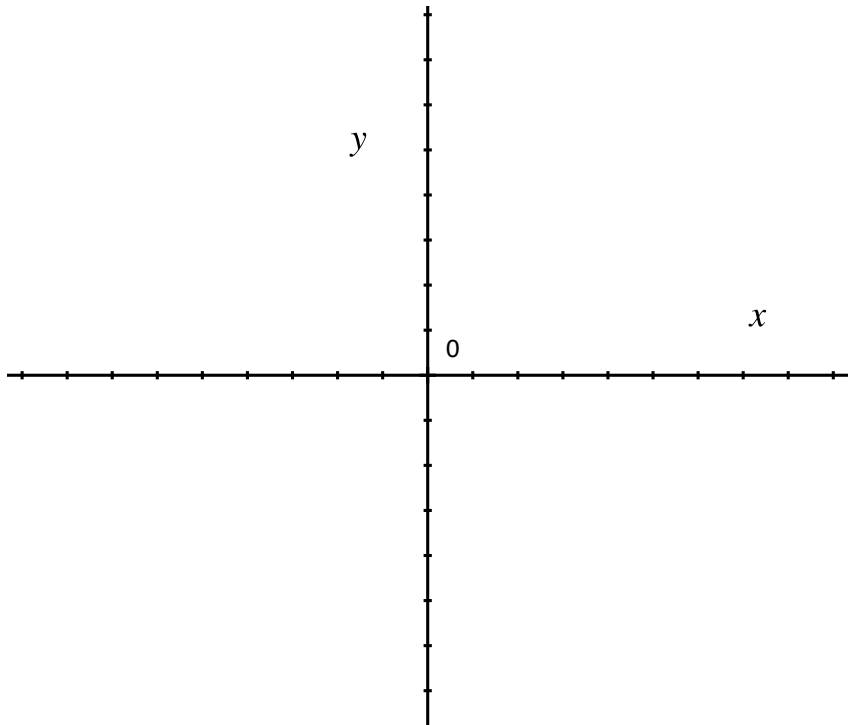
(a) (4 pts.) What is the domain of $g(x)$?

(b) (8 pts.) What are the x -intercepts of $g(x)$?

8. (8 pts.) You have an account that gives 11% compounded semiannually. If you invested \$25,000 today, when will you have \$100,000 in the account? (Include units in your answer.)

9. (12 pts.) Let $f(x) = \begin{cases} 3 - 3x & \text{if } x < 0 \\ x^2 & \text{if } x \geq 0 \end{cases}$

(a) (6 pts.) Graph $f(x)$ on the given axis. Clearly label at least 3 points.



(b) (6 pts.) Find **all** x -values for which $f(x) = 100$.