

Math 194: Exam 3
Summer – 2015
08/13/2015
140 Minutes

Name: _____

Write your name on the appropriate line on the exam cover sheet. This exam contains 12 pages (including this cover page) and 11 questions. Check that you have every page of the exam. Answer the questions in the spaces provided on the question sheets. Be sure to answer every part of each question and show all your work. If you run out of room for an answer, continue on the back of the page — being sure to indicate the problem number.

Question	Points	Score
1	5	
2	9	
3	10	
4	12	
5	8	
6	6	
7	10	
8	9	
9	9	
10	10	
11	12	
Total:	100	

1. Complete the following parts:

(a) (1 point) Define domain:

(b) (1 point) Define range:

(c) (1 point) Define linear function:

(d) (1 point) Define exponential function:

(e) (1 point) Are the domains of $f(x) = \sqrt{x-1}$ and $g(x) = \log(x-1)$ the same? Explain.

2. Complete the following parts:

(a) (2 points) Find the equation of a line with slope 6 and y -intercept -5 .

(b) (2 points) Find the equation of a line passing through the point $(3, 1)$ with slope 2.

(c) (2 points) Find the equation of a line passing through the points $(2, 7)$ and $(-1, -8)$.

(d) (3 points) Find the equation of a parabola with x -intercepts $-2, 1$ and containing the point $(2, 12)$.

3. Let $f(x) = 3 - 2x$ and $g(x) = 2x^2 + 7x - 15$

(a) (2 points) What is $f(2)$?

(b) (2 points) What is $f(g(x))$?

(c) (2 points) Factor $g(x)$.

(d) (4 points) Find the points of intersection between $f(x)$ and $g(x)$.

4. Macrosoft and Orange are both computer technologies companies. The profits of the companies, in hundreds of millions, t years after 2000 are given by $O(t) = 3t + 1$ and $M(t) = -t^2 + 5t + 6$, respectively.

(a) (2 points) What is the x -intercept for $O(t)$? What might it represent in this context?

(b) (2 points) What is the y -intercept for $O(t)$? What does it represent in this context?

(c) (2 points) What is the maximum profit for $M(t)$?

(d) (6 points) What year do the companies make the same profit?

5. Complete the following parts:

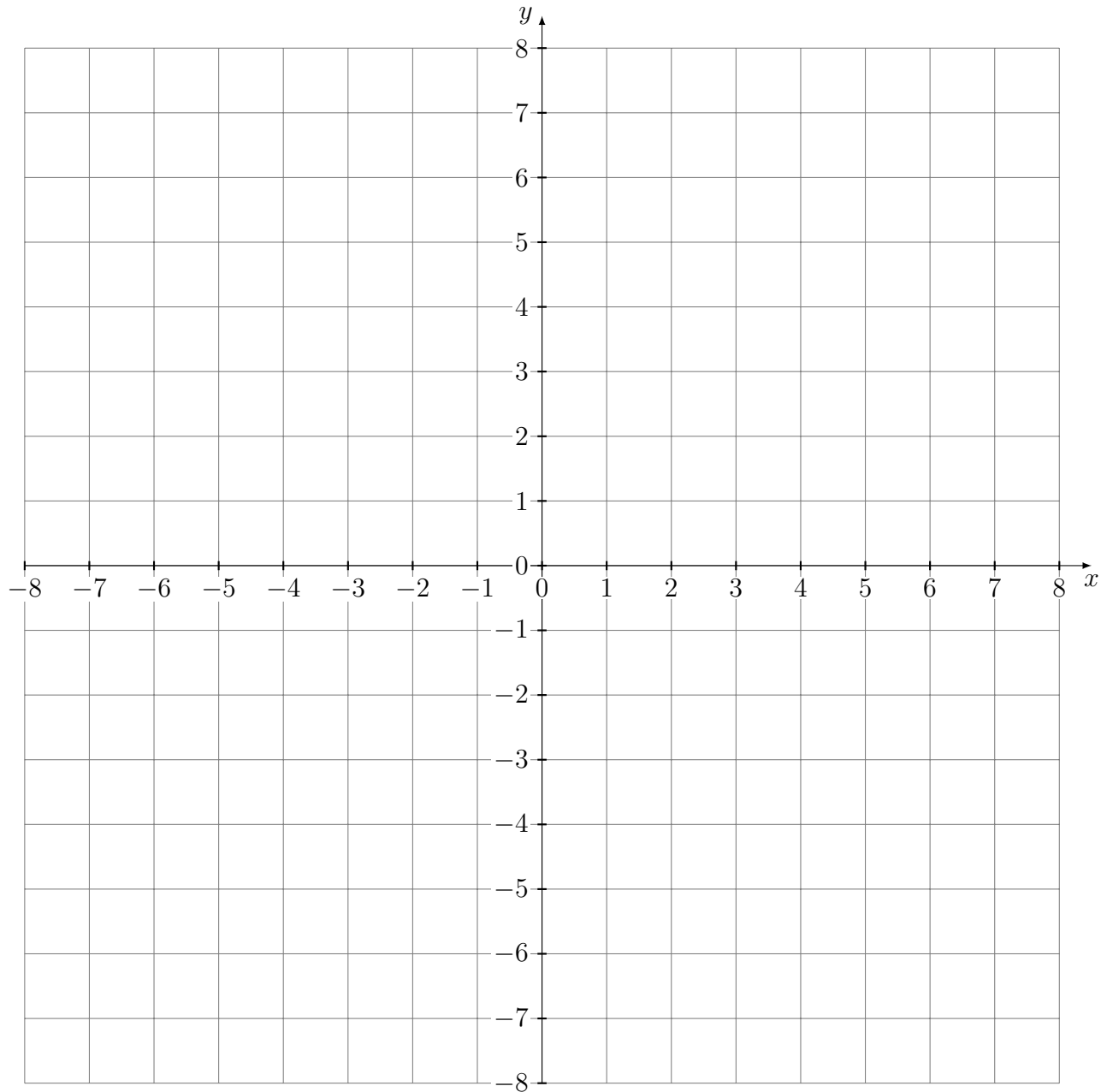
(a) (2 points) Write the equation $5^x = 7$ in terms of logs.

(b) (2 points) Write the equation $y = \log_6 2$ in terms of exponents.

(c) (4 points) Find the equation of an exponential function containing the points $(-1, 45)$ and $(1, 5)$.

6. (6 points) Use the coordinate plane below to graph the function

$$f(x) = \begin{cases} -2x - 1, & x \leq 0 \\ \frac{1}{2}x + 1, & x > 0 \end{cases}$$



7. Solve the following equations for x :

(a) (3 points)

$$4x^2 3^x - 3^{x+2} = 0$$

(b) (3 points)

$$\log_2(4x) - \log_3(x) = \log_3(x + 2) + \log_2(2x)$$

(c) (4 points)

$$e^{2x} + 3e^x - 10 = 0$$

8. (9 points) Choose **one** of the following problems and complete it in its entirety. Place a checkmark next to the number of the problem you have chosen.
- (i) A bank account is opened with an initial deposit of \$4000. The account has a monthly compounded interest rate of 7%. Write a function, $M(t)$, representing the amount of money in the account t years after it was opened. How much is in the account after 3 years? When does the account have \$5500?
 - (ii) A certain radioactive substance has a half-life time of 3.6 years. If 223kg of this substance is stored away, write a function, $A(t)$, representing the amount of this radioactive substance remaining after t years. How much of this substance is left after 2 years? When will only 127kg of this substance remain?

9. Complete the following parts:

(a) (3 points) How many digits does $163^{15,163}$ have?

(b) (3 points) If $\ln(\log_3 x) = 13$, how many digits does x have?

(c) (3 points) If you invest \$2000 in a bank account at 6% interest compounded continuously, how much money is in the account after 5 years?

10. Complete the following parts:

(a) (2 points) Find the equation of a line perpendicular to the line $y = \frac{3}{2}x + 2$ and containing the point $(6, 11)$.

(b) (2 points) If $f(x)$ is a function, what does the graph of $g(x) = f(x + 2) - 5$ look like compared to the graph of $f(x)$?

(c) (2 points) What is the growth/shrink rate of the functions $r(s) = 7(1.15)^s$ and $q(n) = 6(0.96)^n$.

(d) (4 points) Simplify the following:

$$\ln(e^2) + \frac{\log_5\left(\frac{1}{25}\right)}{\log_3(9)} + e^{2\ln x} - \log_6(6^4)$$

11. Define $f(x)$ to be the following function

$$f(x) = \frac{(x-1)(x+2)(x+3)(x-4)}{(x-2)(x+5)(2x-12)(x-1)}$$

- (a) (3 points) What are the roots of $f(x)$?
- (b) (3 points) What, if any, are the vertical asymptotes?
- (c) (3 points) What, if any, are the horizontal asymptotes?
- (d) (2 points) What, if any, are the holes of $f(x)$?
- (e) (1 point) Does $f(x)$ have a slant asymptote? Explain.