By providing my signature below I acknowledge that I abide by the University's academic honesty policy. This is my work, and I did not get any help from anyone else during the exam:

Name (sign): _____   Name (print): _____

Student Number: _____

Instructor's Name: _____   Class Time: _____

- If you need extra space use the last page.

- Please show your work. **An unjustified answer may receive little or no credit.**

- If you make use of a theorem to justify a conclusion then state the theorem used by name.

- Your work must be **neat**. If I can't read it (or can't find it), I can't grade it.

- The total number of possible points that is assigned for each problem is shown here. The number of points for each subproblem is shown within the exam.

- Please turn off your mobile phone.

- A calculator is not necessary, but numerical answers should be given in a form that can be directly entered into a calculator.

Problem Number	Points Possible	Points Made
1	15	
2	15	
3	20	
4	10	
5	10	
6	15	
7	15	
Total:	100	

1. The graph of three functions is given in the plot below. Use the graph to answer the questions below.
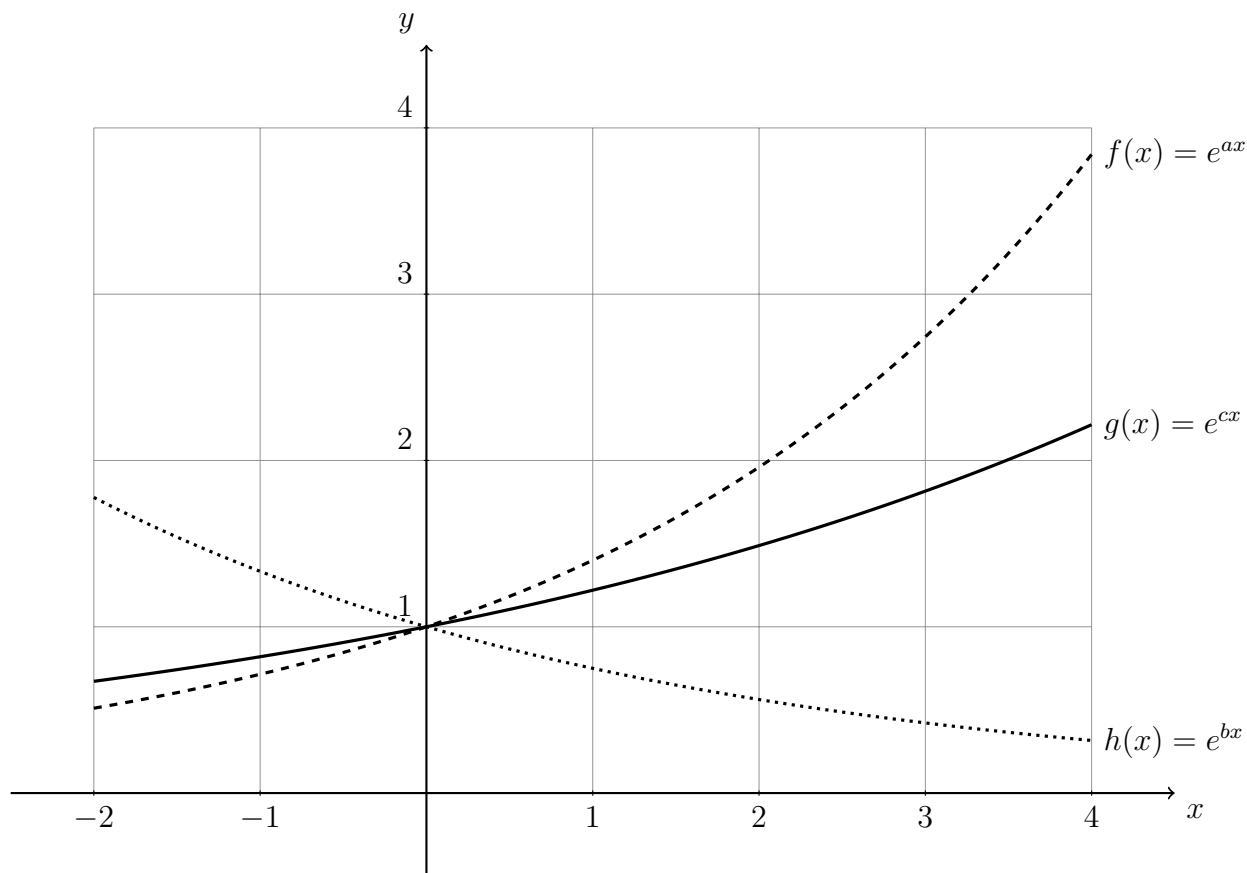
_____ (a) [5 pts] List the numbers a, b, and c from lowest to highest. (Do not estimate their values just list them to specify which one is lowest, the middle value, and the highest value.)

_____ (b) [5 pts] Which value(s) (a, b, or c) are negative?

(c) [5 pts] Is $f(x)$ a one-to-one function? (Briefly explain your reasoning based on the graph of the function.)

_____

2. For each scenario below circle the phrase that best describes the **kind** of function that will best approximate the phenomena described.

_____ (a) [3 pts] The amount of radioactive material present after a given time period.

Linear   Quadratic   Exponential
Function   Function   Function

_____ (b) [3 pts] The number of shoes produced at a factory as a function of time where the shoes are produced at a constant rate.

Linear   Quadratic   Exponential
Function   Function   Function

_____ (c) [3 pts] The amount of material present decays due to bacteria and the amount that degrades depends on the amount of material present.

Linear   Quadratic   Exponential
Function   Function   Function

_____ (d) [3 pts] The area of a square as a function of the length of its sides.

Linear   Quadratic   Exponential
Function   Function   Function

_____ (e) [3 pts] The number of animals present in a population, and the number of births depends on the number of animals present.

Linear   Quadratic   Exponential
Function   Function   Function

3. Determine the values of x that satisfies each equation below. Print your answer in the box provided, and your answer should be an exact answer. (No decimal approximations.)

    (a) [10 pts] $\ln(3x) - \ln(x - 1) = 2$.

$x =$

    (b) [10 pts] $8 \cdot 3^x = 7^x$.

$x =$

4. [10 pts] Determine if the function

$$L(x) \ = \ \sqrt{x} + 4$$

is a one-to-one function. (Fully justify your reasoning without referring to the graph of the function.)

5. [10 pts] Determine the inverse of the function

$$K(x) \;=\; 3e^{4t}.$$

Points earned: _____
out of a possible 10 points

6. Given the relationship

$$\ln(y) \;=\; 3\ln(x+1) - 2\ln(x-4) + \ln(x-2)$$

answer the following questions.

(a) [6 pts] Determine the smallest value of a so that the equation above is valid for all $x > a$.

(b) [9 pts] Determine an equation for y as a function of x that does not include any logarithms.

7. [15 pts] A radioactive material decays. There is initially 10 kg of material, and after 40 years there is 8 kg of material. How long will it takes before the amount is reduced by 50% from the original amount?

Extra space for work. **Do not detach this page.** If you want us to consider the work on this page you should print your name, instructor and class meeting time below.

Name (print): _____ Instructor (print): _____ Time: _____