

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: _____

Problem Number	Points Possible	Points Made
1	15	
2	15	
3	16	
4	12	
5	12	
6	15	
7	15	
Total:	100	

- 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.
- Common identities:

$$\begin{aligned}\cos(\alpha + \beta) &= \cos(\alpha)\cos(\beta) - \sin(\alpha)\sin(\beta), \\ \sin(\alpha + \beta) &= \sin(\alpha)\cos(\beta) + \cos(\alpha)\sin(\beta).\end{aligned}$$

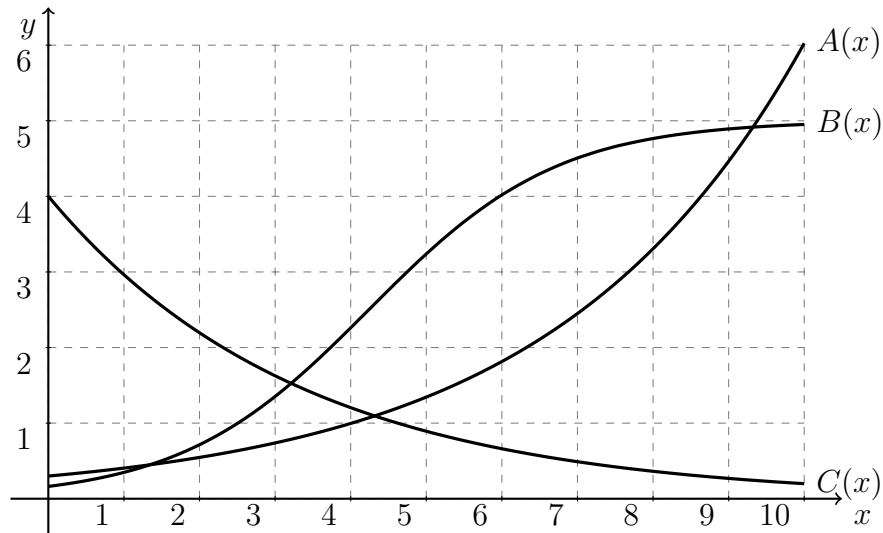
1. Determine all of the values of x for each equation below that satisfies the expression.

(a) [5 pts] $e^{3x+1} = \ln(4)$

(b) [5 pts] $\ln(8x - 1) = 2$

(c) [5 pts] $3 \cdot 4^{x+1} = 87$

2. The graphs of three functions are given in the plot below.



_____ (a) [5 pts] Circle the type of function that best describes $A(x)$.

Exponential
Decay

Exponential
Growth

Logistic
Function

Linear

_____ (b) [5 pts] Circle the type of function that best describes $B(x)$.

Exponential
Decay

Exponential
Growth

Logistic
Function

Linear

_____ (c) [5 pts] Circle the type of function that best describes $C(x)$.

Exponential
Decay

Exponential
Growth

Logistic
Function

Linear

3. Given the following values determine the exact numerical value of each of the expressions below,

$$\ln(a) = 4.5,$$

$$\ln(b) = -1.5,$$

$$e^r = 100.8,$$

$$e^s = 44.0.$$

Use the algebraic properties of the functions to rearrange the expressions in a form where the values above can be substituted into the expressions.

_____ (a) [4 pts] $\ln(a \cdot b)$

_____ (b) [4 pts] $\ln\left(\frac{a^2}{b}\right)$

_____ (c) [4 pts] e^{2r+s}

_____ (d) [4 pts] e^{r-3s}

4. [12 pts] Determine the inverse of the function

$$R(x) = 3 + e^{-2x}.$$

(Alternate question: show that a given function is 1-1.)

5. A bank account is opened with an initial balance of \$1,000. The bank compounds the interest monthly at an annual rate of 1.2%.

_____ (a) [6 pts] What is the balance after 3 years?

(b) [6 pts] What would the balance be after 3 years if the interest is compounded weekly?

6. [15 pts] The amount of a a radioactive compound in a sample decays exponentially. The sample initially contains 50g of the compound, and after three years contains 40g. How long will it take until there is 30g of material?

7. [15 pts] The number of insects in a population of angry wasps increases by 15% each year. The population is cut in half due to a sudden weather event. How long will it take for the population to return to its previous number?
- _____

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: _____