

Print and sign a brief statement stating this is your work and you used no other resource:

Name (sign): _____

Name (print): _____

Student Number: _____

Instructor's Name: _____

Class Time: _____

Problem Number	Points Possible	Points Made
??	0	
??	21	
??	18	
??	18	
??	10	
??	18	
??	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:

$$\cos(\alpha + \beta) = \cos(\alpha)\cos(\beta) - \sin(\alpha)\sin(\beta), \quad \sin(\alpha + \beta) = \sin(\alpha)\cos(\beta) + \cos(\alpha)\sin(\beta).$$

1. Common Knowledge: Who is the better sprinter Elisa Balsamo, Charlotte Kool, or Lorena Wiebes?

2. Determine all of the values of x for each question below that satisfy the given equation. If no values of x satisfy the equation provide a brief justification as to how you arrived at your conclusion.

(a)

$$\ln(x - 1) = 3.$$

$$e^{4x+1} = 8.$$

(b)

(c)

$$\ln(x) + \ln(x + 1) = 2.$$

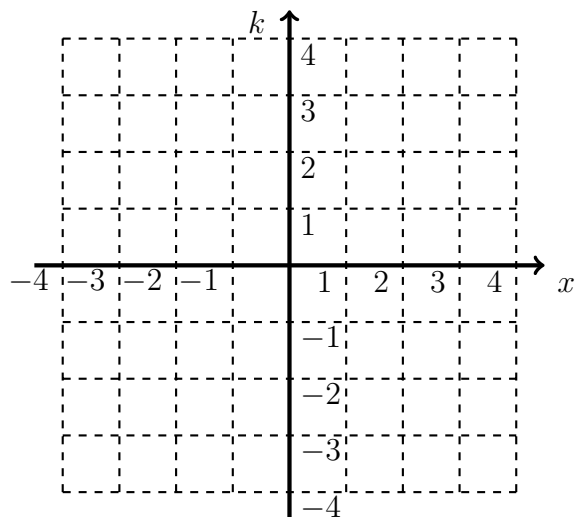
(d)

$$3 \cdot 8^{2x+1} = 14 \cdot 6^{1-x}.$$

3. The questions below refer to the function,

$$Ra(x) = \ln(x + 1) + 2.$$

- (a) Use the axes below to draw a sketch of the graph of $Ra(x)$. **Also, state the domain and range of the function.**



- (b) Show that the function $Ra(x)$ is one-to-one.

- (c) Determine the inverse of the function $Ra(x)$.

4. The function $Kr(x)$ is defined by

$$Kr(x) = 3 + C \cdot e^{rx}.$$

It is known that $Kr(0) = 2.1$ and $Kr(10) = 2.9$.

- (a) Determine the values of the constants C and r .

- (b) What is the value of $Kr(100)$? What value does the function get close to as x gets very large?

- (c) What is the value of x when $Kr(x) = 2.99$?

5. For each of the following expressions, simplify as indicated.

(a) Write the following as a single exponential:

$$\left(\frac{e^{2x+2}}{e^{4x-1}} e^{x^2} \right)^3$$

(b) Write the following as a single logarithm:

$$\frac{1}{2} \ln(3x + 1) - 7 \ln(1 - x) + 1.$$

6.

Given the approximations below determine approximations for each of the expressions that follow,

$$\log_b(3) \approx 0.458, \quad \log_b(4) \approx 0.578, \quad \log_b(20) \approx 1.249,$$

(a) $\log_b(12)$.

(b) $\log_b(5)$.

(c) $\log_b(2)$.

7.

A bank offers different accounts with interest rates that are compounded monthly.

- _____ (a) One account offers an interest rate of 1.3% compounded monthly. If the initial principal is \$10,000 what will the balance be after four years?

- (b) Another account offers an interest rate of 1.1% compounded monthly. How long will it take to double the initial balance?

- (c) A customer deposited \$20,000 into an account whose interest was compounded monthly and forgot about it. After thirty years the balance on the account was \$34,000. What was the interest rate on the account?

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: _____