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.
- Common identities:
  \[ \cos(\alpha + \beta) = \cos(\alpha)\cos(\beta) - \sin(\alpha)\sin(\beta), \]
  \[ \sin(\alpha + \beta) = \sin(\alpha)\cos(\beta) + \cos(\alpha)\sin(\beta). \]

1. [2 Bonus] Common Knowledge: Was it a good idea for Blanka Vas to skip the World Championships?
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) [7 pts] \( \ln(4x - 3) = 783 \).

(b) [7 pts] \( \log_{10}(x) + \log_{10}(x - 1) = 2 \).
(c) [7 pts] \(6^{2x+1} = 3\).

(d) [8 pts] \(18 \cdot 7^{x-1} = 13 \cdot 4^{8x+1}\)
3. Sketch functions that match the descriptions given below.

(a) [7 pts] Make a rough sketch of a function that has domain \([-4, 4]\), and the function is 1-1. Briefly explain why the function is 1-1 and do not simply state that it passes some particular test. State whether or not an inverse of your function exists.

(b) [7 pts] Make a rough sketch of a function that has domain \([-4, 4]\), and the function is not 1-1. Briefly explain why the function is not 1-1 and do not simply state that it passes some particular test. State whether or not an inverse of your function exists.
4. A function is used to approximate a system that exhibits exponential growth,

\[ H(t) = Ce^{rt}. \]

The function should return a positive value.

(a) [5 pts] What are the possible values of \( C \) and \( r \)? Express your answers as intervals, and the possible values could be any number in the stated interval.

(b) [5 pts] If it is known that \( H(2) = 5 \) and \( H(3) = 8 \) determine the values of \( C \) and \( r \).
5. Two bank accounts are examined, and both offer an annual interest rate that is compounded monthly.

(a) [9 pts] The first bank account offers an annual interest rate of 1.2% compounded monthly. Determine how much money will be in the account after two years if $10,000 is deposited in the account.

(b) [9 pts] The first bank account offers an annual interest rate of 1.2% compounded monthly. How long will it take for the amount of money in the account to double?

(c) [9 pts] A bank officer says that if you deposit $15,000 into the second account, the account’s balance after three years will be $15,800. What is the annual interest rate for the account?
6. The PR interval (abbreviated PR) for a mammal is the time between contractions of the left atrium and the left ventricle. Experiments\textsuperscript{1} have shown that the body mass (BM) of a mammal and its PR are related by

\[ \ln (PR) = 2.4 + 0.24 \ln (BM). \]

(a) [10 pts] Determine the formula that provides the PR as a function of BM for a mammal. (There should not be any logarithms in your final answer.)

(b) [10 pts] Determine the formula that provides the BM as a function of PR for a mammal. (There should not be any logarithms in your final answer.)

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: ____________