

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	
??	29	
??	14	
??	10	
??	27	
??	20	
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: 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)

$$\ln(4x - 3) = 783.$$

$$\log_{10}(x) + \log_{10}(x - 1) = 2.$$

(b)

(c) $6^{2x+1} = 3.$

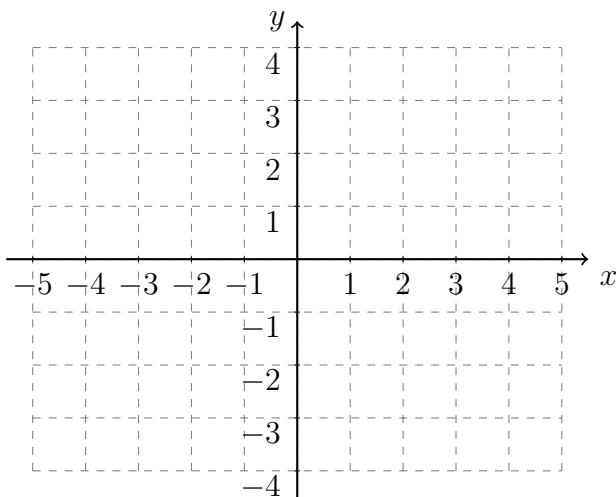
$$18 \cdot 7^{x-1} = 13 \cdot 4^{8x+1}$$

(d)

(a)

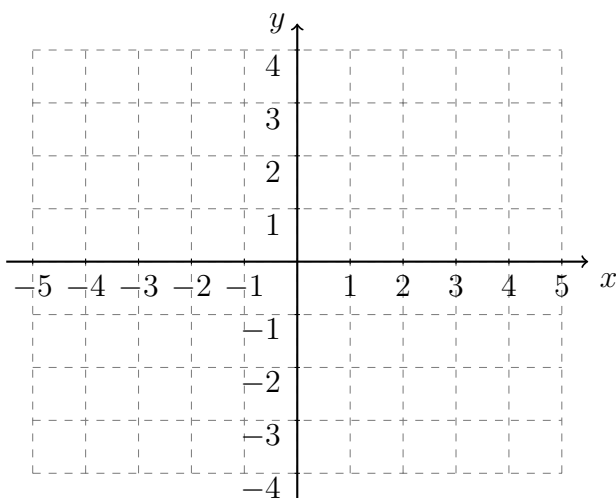
3. Sketch functions that match the descriptions given below.

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)

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**,

$$H(t) = Ce^{rt}.$$

(a)

The function should return a positive value.

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)

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) 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) 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) 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. Experiments¹ have shown that the body mass (BM) of a mammal and its PR are related by

$$\ln(\text{PR}) = 2.4 + 0.24 \ln(\text{BM}).$$

- (a) 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) 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.)

¹Bassil G, Zarzoso M, Noujaim SF. Allometric scaling of electrical excitation and propagation in the mammalian heart. J Theor Biol. 2017 Apr 21;419:238-242. doi: 10.1016/j.jtbi.2016.09.024. Epub 2016 Sep 26

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: _____