

Math 151-D1 Calculus I  
Midterm 2, March 8  
Instructor: Matt DeVos

First Name (please print): \_\_\_\_\_

Last Name (please print): \_\_\_\_\_

SFU email ID: \_\_\_\_\_

Signature: \_\_\_\_\_

1. DO NOT OPEN THIS BOOKLET UNTIL INSTRUCTED TO DO SO
2. Fill in the above box.
3. Once the exam begins, check that your exam has 6 questions and 7 pages.
4. Only the usual writing instruments, this booklet, and a scientific calculators are allowed. **No graphing or programmable calculators are permitted.**
5. During this examination, speaking to, communicating with, or exposing written papers to the view of other students is forbidden.
6. You may use the back of the previous page for rough work or if you run out of space.
7. Stop writing when you are instructed to do so. Failure to follow instructions may result in penalties.

Problem	Score	Value
1		4
2		4
3		2
4		4
5		4
6		6
Total:		24

**Problem 1.** (*4 points*) Mark each statement as true (**T**) or false (**F**)

\_\_\_\_\_ If  $f'(x) > 0$  for every  $x$ , then  $f(x)$  has at most one real root.

\_\_\_\_\_  $\sinh(-x) = -\sinh(x)$

\_\_\_\_\_ If  $f(x)$  is a continuous function, then  $f(x)$  has a global maximum.

\_\_\_\_\_ If  $c$  is a local minimum of the function  $f(x)$ , then  $f'(c) = 0$ .

**Problem 2.** (*4 points*) Find  $y'$  for each of the following functions.

(i) (*2 points*)  $y = \ln(\cosh x)$

(ii) (*2 points*)  $y = x^{(x^2+1)}$

**Problem 3.** (*2 points*) Find  $\frac{d^n y}{dx^n}$  for the function  $y = e^{-3x}$ .

**Problem 4.** (*4 points*) Verify that the function  $f(x) = x^3 + 4x$  on the interval  $[-1, 2]$  satisfies the hypothesis of the Mean Value Theorem. Find all points  $c$  which satisfy the conclusion.

**Problem 5.** (*4 points*) Find the maximum and minimum of the function  $f(x) = \frac{x}{x^2+1}$  on the interval  $[0, 2]$ .

**Problem 6.** (*6 points*) A man facing North sees a river which flows East. He tosses a stick into the water exactly  $3m$  North of where he stands. The river carries the stick East at a constant rate of  $2m/s$ . How fast is the stick moving away from the man after 2 seconds?