

PRINT NAME: \_\_\_\_\_

STUDENT ID NUMBER: \_\_\_\_\_

1. No books and notes are allowed.
2. You may use a calculator and a notecard.
3. Show your work in details.

Problem	Points	Score
1	10	
2	30	
3	15	
4	15	
5	15	
6	15	
Total	100	

2

1. (10 points) Solve the following equations for  $x$ .

(a) (5 points)  $2^x \cdot 2^{x+2} = 1$

(b) (5 points)  $2^x + 2^{x+2} = 1$

2. (30 points) Let  $f(x) = \frac{e^x + 1}{e^x - 1}$ .

(a) (15 points) Find the inverse function  $f^{-1}(x)$  of  $f(x)$ .

(b) (15 points) What are the domains and ranges of  $f(x)$  and  $f^{-1}(x)$ ?

4

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- (15 points) Find the tangent line of the curve  $y = x^2$  at the point  $(1, 1)$ . (Do not use the laws of derivative to find the slope. Compute it using its definition.)

4. (15 points) Let  $c$  be a constant and

$$f(x) = \begin{cases} x - c & \text{if } x \geq 1 \\ c - 3x & \text{if } x < 1 \end{cases}.$$

For what values of  $c$  is  $f(x)$  continuous everywhere on  $(-\infty, \infty)$ ?  
You must justify your answer.

6

5. (15 points) Find all the horizontal and vertical asymptotes of the curve

$$y = \frac{x}{\sqrt{x^2 + 3x + 2}}$$

6. (15 points) Find the following limits if they exist.

(a) (5 points)  $\lim_{x \rightarrow 2} \frac{x^2 - 1}{x^3 - 1}$ .

(b) (5 points)  $\lim_{x \rightarrow 1} \frac{x^2 - 1}{x^3 - 1}$ .

(c) (5 points)  $\lim_{x \rightarrow \infty} \frac{x^2 - 1}{x^3 - 1}$ .