

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.

2

1. (10 points) Solve the equation

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

for x .

2. (30 points) Let $f(x) = \frac{x-1}{x+1}$. (The domain of $f(x)$ is wherever $\frac{x-1}{x+1}$ is defined.)

(a) (10 points) Find the inverse function $f^{-1}(x)$ of $f(x)$.

(b) (10 points) What are the domains and ranges of $f(x)$ and $f^{-1}(x)$?

(c) (10 points) Find all horizontal asymptotes of $y = f(x)$ and $y = f^{-1}(x)$.

4

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

4. (10 points) Let

$$f(x) = \begin{cases} \sin x & \text{if } x \geq \pi/4 \\ \cos x & \text{if } x < \pi/4 \end{cases}.$$

Is $f(x)$ continuous everywhere on $(-\infty, \infty)$? You must justify your answer.

6

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

$$y = \sqrt{x^2 + x + 2} - x.$$

6. (20 points) Find the following limits if they exist.

(a) (10 points) $\lim_{x \rightarrow 1} \frac{x^2 - 3x + 2}{x^2 - 4x + 3}$.

(b) (10 points) $\lim_{x \rightarrow 0^+} e^{-1/x}$.