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.
(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 \( y = f^{-1}(x) \).
(3) (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.
(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) \[ \lim_{x \to 1} \frac{x^2 - 3x + 2}{x^2 - 4x + 3}. \]

(b) (10 points) \[ \lim_{x \to 0^+} e^{-1/x}. \]