

NOTES:

1. Make sure your NAME is on the front of the green book.
 2. PLEASE *label* (or underline or box in) all ANSWERS clearly.
 3. Start EACH problem on a NEW PAGE SIDE!
 4. Problems can be written in the green book in ANY ORDER, but they must be properly LABELED.
 5. There are 100 points possible on this test. The point value of each problem is listed in parenthesis after the number.
 6. Show your WORK and write NEATLY! — partial credit is possible only when all work needed to obtain an answer is presented legibly.
 7. **NO CALCULATORS.**
1. (12) If $f(x) = (x - 1)/(x + 1)$ and $g(x) = (1 - x)/(1 + x)$ and both are defined only for non-negative values of x , is $f(1/(x + 1)) = g(x + 1)$? Why (not)?
 2. (10) Evaluate: $\lim_{t \rightarrow 2} \frac{(t^2 - 4)(t + 1)}{t^2 - t - 2}$
 3. (10) Evaluate $\lim_{x \rightarrow \infty} \frac{x^4 - 1}{(x^2 + 1)(x^2 - 2x)}$
 4. (16) (a) Using ONLY the *definition* of the derivative (and not anything learned from other courses!), find the slope of the curve $y = (2x - 1)^2$ at $x = 1$.
(b) Find the equation of the line tangent to the curve in (a) at $x = 1$.
 5. (12) If $f(x) = \begin{cases} (x - 4)^2 & \text{for } x < 1 \\ 9 - x & \text{for } x \geq 1 \end{cases}$
(a) what is $\lim_{x \rightarrow 1^+} f(x)$? (b) what is $\lim_{x \rightarrow 1^-} f(x)$?
 6. (10) Evaluate: $\lim_{x \rightarrow 0} \frac{x + x \cos x}{\sin x \cos x}$.
 7. (15) Let $f(x)$ be defined below. If it is continuous, show why. If $f(x)$ is not continuous, give the point(s) of discontinuity and suggest a variation (or variations) at specific point (or points) which would make $f(x)$ continuous (i.e., the “continuous extension”).
$$f(x) = \begin{cases} x + 6 & x < 2 \\ 8 & x = 2 \\ 10 - x & 2 < x < 3 \\ 6 & x = 3 \\ x^2 - 2 & x > 3 \end{cases}$$
 8. (15) What is (are) the asymptote(s) of $y = \frac{x^2 - 1}{2x + 4}$? For each asymptote, give its type (i.e., *vertical*, *horizontal*, or *oblique*).