

MAT 129 –002

Fall 2009

Test One

Calculators may not be used on this test.

$$1. f(x) = \begin{cases} x+1 & x \leq 1 \\ \frac{1}{x} & 1 < x < 3. \text{ Determine} \\ \sqrt{x-3} & x \geq 3 \end{cases}$$

1a. $\lim_{x \rightarrow 3^-} f(x)$.

1b. $\lim_{x \rightarrow 3^+} f(x)$.

1c. $\lim_{x \rightarrow 3} f(x)$.

1d. Is $f(x)$ continuous at $x = 3$? If not, what kind of discontinuity is it?

2. Determine $\lim_{x \rightarrow 4} \frac{x^2 - 4x}{x^2 - 3x - 4}$.

3. Determine $\lim_{x \rightarrow 0} \frac{\sin 7x}{4x}$.

4. Use the limit definition of derivative to calculate $f'(x)$ where $f(x) = 4x^2 - 2x + 3$.

For the remaining problems, you do not need to use the limit definition of derivative.

5. Determine $f'(x)$ where $f(x) = 2\sqrt{x^3} + \sqrt[3]{x^2}$.

6. Determine $f'(x)$ where $f(x) = (x^2 + x^{-1})(x^5 - 2x^2)$.

7. Determine $f'(x)$ where $f(x) = \frac{x^3 + x}{x^4 - 2}$.

8. Find the point(s) on the curve $y = x^3 - 3x^2 + 1$ where the tangent line is horizontal.

9. Write an equation of the tangent line to $y = x^3 - 5x + 1$ at $(1, -3)$.

10. The position of a particle is given by $s = t^3 - 6t^2 + 9t$.

When is the particle at rest?