1. [7pts] Let \( f(x) = \begin{cases} 1 + 2x & \text{if } x < 1 \\ x^2 + 2 & \text{if } x > 1 \end{cases} \). 

Find \( \lim_{x \to 2} f(x) \), \( \lim_{x \to 1^-} f(x) \), \( \lim_{x \to 1^+} f(x) \), \( \lim_{x \to \infty} f(x) \), \( \lim_{x \to -\infty} f(x) \). Is \( f \) continuous at \( x = 1 \)?

2. [6pts] Find, if they exist:

(a) \( \lim_{x \to 2} \frac{x^2 + 3x - 10}{x^2 - 6x + 8} \)

(b) \( \lim_{x \to -\infty} \frac{x(3 - x^2)}{x^3 + x + 1} \)
3. [6pts] Let $y = x^2 + 3x - 4$. Find
(a) The rate of change of $y$ w.r.t. $x$ when $x = 3$
(b) The relative rate of change and the percentage rate of change when $x = 3$.

4. [4pts] The total cost function for a manufacturer is $c = \frac{(q + 1)^2}{q + 2} + 600$. Find the marginal cost function.
5. [6pts] A manufacturer has determined that that \( m \)

6. [4pts] Find an equation of the tangent line to the curve \( y = x (\ln(x) - 1) \) when \( x = e^2 \).
7. [4pts] Find $f'(1)$ if $f(t) = 5^{2t^2 + 2t - 3}$.

8. [4pts] Find $y'$ if $e^y = (y + 1)e^x$. 