



I. Evaluate the following limits.

1. $\lim_{x \rightarrow \frac{2}{3}} \frac{27x^3 - 8}{3x^2 - 5x + 2}$ (4 points)

3. $\lim_{x \rightarrow -\infty} \frac{x - \sqrt{4x^2 + 1}}{6x - 7}$ (4 points)

2. $\lim_{\theta \rightarrow 0} \frac{\tan^2 3\theta}{\theta^3 + 2\theta^2}$ (5 points)

4. $\lim_{x \rightarrow \frac{1}{2}^-} \left(\frac{1}{|2x - 1|} + \frac{1}{4x^2 - 1} \right)$ (5 points)

II. Given: $f(x) = \begin{cases} \frac{x - \lfloor x + 1 \rfloor}{x^2 - 3x + 2}, & x < 1 \\ \frac{6 - 3\sqrt{x}}{x - 4}, & x \geq 1 \end{cases}$

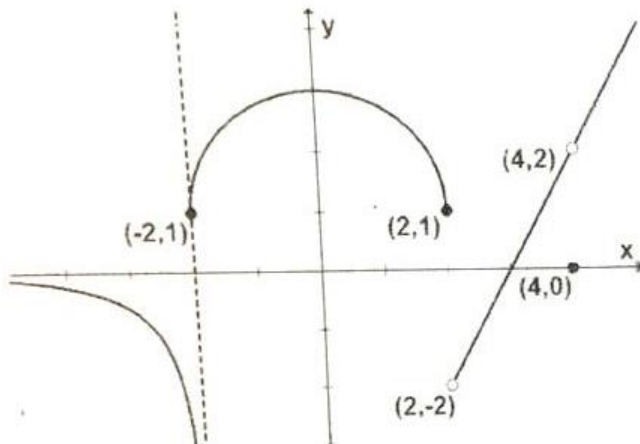
Discuss the continuity of f at $x = 0, 1, 4$. If discontinuous, classify the discontinuity as either removable, jump essential or infinite essential. (12 points)

III. Do as indicated.

1. Use the Intermediate Value Theorem to show that $f(x) = 2x^3 - 3\sin x - 9$ has at least one real zero between 0 and π . (3 points)

2. Use the Squeeze Theorem to evaluate $\lim_{x \rightarrow +\infty} \frac{x \cos 5x}{3x^2 - 1}$. (3 points)

3. Suppose that the graph of $y = f(x)$ is given by the following figure: (1 point each)



- (a) Find $\lim_{x \rightarrow -\infty} f(x)$.
 (b) Find $\lim_{x \rightarrow -2^+} f(x)$.
 (c) Find $\lim_{x \rightarrow 4} f(x)$.
 (d) Find all values a such that f is discontinuous at $x = a$.

END OF EXAM