MAT 1500 (Dr. Fuentes) Worksheet 2 (PART 2) - Sections 2.2 & 2.3

Section 2.2: The Limit of a Function

Problem 1. Determine the limits below.

(a) $\lim_{x\to 1^+} \ln(\sqrt{x}-1)$ (b) $\lim_{x\to 0^+} \ln(\sin(x))$

HINT: Remember, $f(x) = \ln(x)$ has a vertical asymptote at $x = 0$, since as $x \to 0^+$, $\ln(x) \to -\infty$.

Problem 2. Find the vertical asymptotes of the functions below. Explain the behavior of the function on either side of the vertical aymptote (e.g., if $x = a$ is a v.a., explain whether the function goes to ∞ or $-\infty$ as $x \to a$.)

$$f(x) = \frac{x^2+1}{3x-2x^2}$$

Section 2.3: Calculating Limits Using Limit Laws

Problem 3. Evaluate each of the following limits if they exist.

(a) $\lim_{h\to 0} \frac{(h-2)^{-1}+2^{-1}}{h}$, (b) $\lim_{t\to 0} \frac{1}{t\sqrt{1+t}} - \frac{1}{t}$ (c) $\lim_{x\to -2} \frac{2-|x|}{2+x}$.

HINTS: (a) Express each term in the numerator as a fraction and then combine them into a single fraction by finding their least common denominator.
(b) Combine the fractions into a single fraction, then rationalize the numerator.
(c) When x is very close to -2, x is negative.

Problem 4. Use the Squeeze Theorem to show that $\lim_{x\to 0^+} \sqrt{x}\, e^{\sin(\pi/x)} = 0$.