Quiz 2: Evaluating Limits Analytically (§2.3-2.5)

Directions: You have 30 minutes to complete this quiz. Work individually.

1. Evaluate the following limits, analytically.

   (a) $\displaystyle\lim_{h \to 5} \frac{5h^2 - 6h + 1}{\sqrt{16 + 4h} + 2}$

   (b) $\displaystyle\lim_{x \to 3} \frac{x - 3}{\sqrt{x + 6} - 3}$

   (c) $\displaystyle\lim_{x \to 0} x \cos\left(\frac{1}{x}\right)$

2. Where applicable, your justification must involve determining the sign of the numerator and denominator for x-values sufficiently close to 0.

$$h(x) = \begin{cases} \dfrac{x-5}{x} & x < 0 \\ \pi & x \geq 0 \end{cases}$$

Evaluate:

(a) $\lim\limits_{x \to 0^+} h(x)$

(b) $\lim\limits_{x \to 0^-} h(x)$

(c) $\lim\limits_{x \to 0} h(x)$

(d) $h(0)$

(e) Does h have a vertical asymptote at the line $x = 0$? Explain why or why not.

3. Use the given information to compute the following limits. Show which limit laws you are using and why you are allowed to use them.

$$\lim_{x \to 1} f(x) = 8 \qquad \lim_{x \to 1} g(x) = 3 \qquad \lim_{x \to 1} h(x) = 2$$

(a) $\lim_{x \to 1} (4 + 3f(x))$

(b) $\lim_{x \to 1} \dfrac{f(x)g(x)}{h(x)^2}$

4. Determine the end behavior for $f(x) = \dfrac{x^2 - 4x + 2}{x - 1}$.