1. (2 points) Which one of the following equations must hold in order for a function $f$ to be continuous at a number $a$?

(a) $\lim_{x \to 0} f(x) = f(a)$
(b) $\lim_{x \to 0} f(x) = 0$
(c) $\lim_{x \to 0} f(x) = a$
(d) $\lim_{x \to a} f(x) = f(a)$
(e) $\lim_{x \to a} f(x) = 0$
(f) $\lim_{x \to a} f(x) = a$
(g) $\lim_{x \to \infty} f(x) = f(a)$
(h) $\lim_{x \to \infty} f(x) = 0$
(i) $\lim_{x \to \infty} f(x) = a$

2. (2 points each) Evaluate the following limits. Show sufficient work to justify each answer.

(a) $\lim_{x \to 0} \frac{\sin (2x)}{x \cos x}$
(b) \( \lim_{x \to 3^+} \frac{8x + 1}{6 - 2x} \)

(c) \( \lim_{x \to \infty} \frac{6 + x^2}{3 + 4x^2} \)

3. (2 points) Prove that \( \lim_{x \to 0} 5x^6 \sin \left( \frac{3}{x} \right) = 0. \)