L'Hôpital's Rule

Use L'Hôpital's Rule when the following conditions are met:

1) $\lim_{x \to c} \frac{f(x)}{g(x)} = \frac{0}{0}$ or $\frac{\infty}{\infty}$

2) $f'(c)$ and $g'(c)$ exist

3) $g'(c) \neq 0$

Step 1: Substitute the value into the limit.
Step 2: Apply L'Hôpital's Rule until the denominator does not equal zero.

Directions: Find the derivative of each.

1. $\lim_{x \to 0} \frac{\sin x}{x}$

2. $\lim_{x \to 0} \frac{2x - \sin x}{x}$

3. $\lim_{x \to 0} \frac{\sqrt{4+x} - 2}{2x}$

4. $\lim_{x \to 0} \dfrac{\sqrt{4+x} - 2 - \dfrac{x}{4}}{2x^2}$

5. $\lim_{x \to \frac{\pi}{2}} \dfrac{\sec x}{1 + \sec x}$

6. $\lim_{x \to 0^+} x \bullet \cot x$

7. $\lim_{x \to 0} \frac{\sin 8x}{x}$

8. $\lim_{x \to 0} \frac{\tan x}{x}$

9. $$\lim_{x \to \frac{\pi}{2}} \frac{x - \frac{\pi}{2}}{\cos x}$$