Point totals are indicated in parentheses. You must show your work to receive credit. You do not need a calculator for any of the problems; consequently, you will not receive credit for any solution based on calculator computations.
1. Evaluate the following limits:

a. \( \lim_{x \to 2} \frac{\frac{1}{x} - \frac{1}{2}}{x - 2} \)

b. \( \lim_{t \to \pi/2} \frac{\sin t + \sqrt{\sin^2 t + 2\cos^2 t}}{2\cos t} \)

c. \( \lim_{h \to \infty} \frac{\frac{1}{h^2} + 1 - \frac{1}{h^3}}{\frac{1}{h^2} - \frac{1}{h^3}} \)
2. The only information known about two functions $f$ and $g$ is that $f(0) = 4 = g(0)$ and that $f'(0) = -1$, $g'(0) = 3$. Using just this information about $f$ and $g$, compute the following limits.

a. $\lim_{h \to 0} \frac{f(h)g(h) - 16}{h}$

b. $\lim_{h \to 0} \frac{2h(f(h) - 4)}{(g(h) - 4)^2}$
3. The graph of a function $f$ is shown below. Use this graph to estimate $f'(-2)$, $f'(-1)$, $f'(0)$, $f'(1)$, and $f'(2)$. (If any of these derivatives don’t exist, explain why.) Then sketch the graph of the derivative function $f'$. 

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[Graph of a function $f$ shown with points and arrows indicating the direction of the derivative function $f'$]
4. Find the equation of the tangent line to the curve \( y = \frac{5x}{\sin x + \cos x} \) at the point \((\pi, -5\pi)\).
5. A particle is traveling along the x-axis. Its position at time $t$ is given by $s(t) = (t^2 - 3)e^t$, $-\infty < t < \infty$.

a. Find all times when the instantaneous velocity of the particle is 0.

b. Find all times when the particle is moving to the left.