8. [12 points] The parts of this problem are unrelated to each other.
   a. [5 points] Compute the following limit. Fully justify your answer including using proper notation.

   \[
   \lim_{x \to \infty} 2x \ln \left(1 + \frac{5}{x}\right)
   \]

   Answer: \[ \lim_{x \to \infty} 2x \ln \left(1 + \frac{5}{x}\right) = \]

   b. [7 points] Compute the value of the following improper integral if it converges. If it does not converge, use a direct computation of the integral to show its divergence. Circle your final answer choice. Show your full computation, and use proper notation.

   \[
   \int_0^3 \frac{1}{(x - 3)^2} \, dx
   \]

   Circle one: Converges to: __________________________ Diverges