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**