

1. **(6 points)** Evaluate the following limits, or demonstrate that they do not exist:

(a) **(2 points)** $\lim_{\theta \rightarrow 0} \frac{\cos \theta - 1}{\theta^2}$.

(b) **(2 points)** $\lim_{x \rightarrow 2} \frac{e^x}{x+2}$.

(c) **(2 points)** $\lim_{x \rightarrow \infty} x e^{-x}$.

2. **(8 points)** You must print a small poster with 200 square inches of printed material and margins of half a inch on the left and right, and a full inch on top and bottom. What dimensions should the poster have to minimize the total area of paper used?

3. **(6 points)** Answer the following questions about the function $f(x) = (2x - 5)e^x$.

(a) **(2 points)** For which values of x is it increasing? For which is it decreasing? Label which is which.

(b) **(2 points)** Find all local extrema of the function and identify each as a local maximum or local minimum.

(c) **(2 points)** For what values of x is the function concave up, and when is it concave down? Label which is which. Identify all points of inflection of the function.

4. **(2 point bonus)** Show that, for a fixed volume, the rectangular prism with least surface area is a cube.