1. Compute the limits of the following:

(a) \( \lim_{{x \to 0}} \frac{\sin 3x}{x} \)

(b) \( \lim_{{x \to \infty}} \frac{\sin x}{x} \)

(c) \( \lim_{{x \to 0}} \frac{e^{2x} - 1}{x} \)

(d) \( \lim_{{x \to 0}} \frac{\int_0^x e^{t^2} \, dt}{x^2} \)

2. Using \( \epsilon - \delta \), prove: \( \lim_{{x \to 2}} (x + 1)(x + 2) = 12 \)

3. Sketch the curve of the equation: \( f(x) = \frac{x^3}{x^2 + 1} \)

4. There is a spool of wire 100 cm long. At what point should I cut the wire, and use the two segments to make two shapes, a square and a circle, such that the sum of their areas is maximized?

5. The radius of a sphere is measured at 10 cm, with 1% error. What is the maximum error in the calculated volume?

6. An equilateral triangular trough with sides 8 cm and length 12 cm is leaking water at the rate of 0.5 cubic centimeters per second. When the water level is 4 cm high, how fast is the water level decreasing?

7. Integrate:

(a) \( \int xe^{-x^2} \, dx \)

(b) \( \int_2^4 \sqrt{4 - (x - 2)^2} \, dx \)

(c) \( \int \frac{x}{x - 1} \, dx \)