1. Draw a picture of the region bounded by the negative $x$-axis, the positive $y$-axis, and the graph of $y = e^x$ (but not bounded to the left). Right down an integral that gives you the area of this region. Is the area finite or infinite?

2. Evaluate the following integrals exactly:
   
   (a) $\int_{-1}^{0} \frac{1}{\sqrt{x}} \, dx$
   
   (b) $\int_{1}^{5} \frac{1}{x^2 - 16} \, dx$
   
   (c) $\int_{0}^{\infty} \frac{x^2}{2x} \, dx$

3. For each of the following integrals, make an intelligent guess as to whether or not the integral converges. Then evaluate the integral (if possible) or use a comparison test to prove your guess.
   
   (a) $\int_{1}^{\infty} \frac{2 + \cos t}{t^2} \, dt$
   
   (b) $\int_{0}^{\infty} \frac{1}{x^{0.9} + x + 2} \, dx$
   
   (c) $\int_{0}^{\infty} \frac{1}{x^{1.1} + x + 2} \, dx$

4. Determine the limits of the following sequences as $n \to \infty$:
   
   $a_n = \frac{3n^3 + 4n^2 + n - 7}{8 + 600n^2 - 5n^3}$

   $b_n = \frac{2^n - 5^n}{e^n + 100}$

   $c_n = (-1)^{n+1} \frac{10n + 1}{2n - 7}$

   $d_n = (-1)^n \sin \left( \frac{2n-1}{2n} \pi \right)$

5. Use comparison tests to determine whether $\int_{2}^{\infty} \frac{dt}{\sqrt{t^3 - t}}$ and $\int_{2}^{\infty} \frac{dt}{\sqrt{t^3 - t}}$ converge or diverge.

6. Does $\int_{0}^{\infty} x^{-2} \, dx$ converge or diverge? How about $\int_{0}^{\infty} x^{-1/2} \, dx$?

7. Does $\int_{0}^{\infty} \cos x \, dx$ converge or diverge? Why?

8. Use the Squeeze Theorem to prove that the sequence $x_n = (-1)^{n-1} \frac{\sin n}{n}$ converges to 0.