25 February 2008

WorkSheet9 (Improper Integrals)

1. Determine if the following integrals are convergent or divergent. Evaluate those that are convergent.

   (a)
   $$\int_{-\infty}^{-1} e^{-2t} dt$$

   (b)
   $$\int_{0}^{\infty} \frac{dz}{z^2 + 3z + 2}$$

   (c)
   $$\int_{0}^{1} \frac{dx}{1 - x^2}$$

   (d)
   $$\int_{-\infty}^{\infty} \frac{x^2}{9 + x^6} dx$$

   (e)
   $$\int_{0}^{\pi} \sec x$$

2. Use the Comparison Theorem to determine whether the integral is convergent or divergent.

   (a)
   $$\int_{1}^{\infty} \frac{\cos^2 x}{1 + x^2} dx$$

   (b)
   $$\int_{0}^{1} \frac{e^{-x}}{\sqrt{x}}$$

3. The integral
   $$\int_{0}^{\infty} \frac{1}{\sqrt{x}(1 + x)} dx$$
   is discontinuous for two reasons. Determine what each of the reasons is. Then evaluate the integral by breaking it up into two different integrals around 1.