Homework Set 11

(sect 6.6: Improper Integrals)

1. Which of the following integrals are improper?

   a. $\int_0^{\infty} x^4 e^{-x^5}\, dx$

   b. $\int_{1/2}^{5} \ln(2x-1)\, dx$

   c. $\int_0^1 \frac{1}{2x-1} dx$

   d. $\int_1^2 \frac{1}{2x-1} dx$

2. Find the area under the curve $y = 1/x^3$ from $x = 1$ to $x = t$ and evaluate for $t = 10, 100, and\ 1000$. Then find the total area under this curve for $x \geq 1$.

Determine whether each integral converges or diverges. If it converges, evaluate the integral.

3. $\int_{-\infty}^{0} \frac{1}{x-5} dx$

4. $\int_4^{\infty} \frac{1}{x\sqrt{x}} dx$

5. $\int_0^{\infty} \frac{e^x}{e^{2x}+4} dx$

6. $\int_{2\pi}^{\infty} \sin\theta \, d\theta$

7. $\int_{2}^{3} \frac{1}{\sqrt{3-x}} dx$

8. $\int_{0}^{33} (x-1)^{-1/5} \, dx$

9. $\int_{0}^{1} x^2 \ln x \, dx$

10. Use the Comparison Theorem to determine whether $\int_{0}^{\infty} \frac{\cos^2 x}{1+x^2} dx$ is convergent or divergent.