**The Limit Comparison Test**

1. Determine whether each of the following integrals converges or diverges:

   (a) $\displaystyle\int_{10}^{\infty} \frac{x^4 - 3x^2 + 10}{x^5 + 3x - 2} dx$

   (b) $\displaystyle\int_{0}^{1} \frac{x^2 + 3\sqrt{x} + \sqrt[3]{x}}{x^{2/3} + x^2 - x^3} dx$

   (c) $\displaystyle\int_{1}^{\infty} x \sin\left(\frac{1}{x^2}\right) dx$

   (d) $\displaystyle\int_{2}^{\infty} \frac{\sin(\frac{1}{x})}{\ln(x+1) - \ln x} dx$

   (e) $\displaystyle\int_{0}^{1} \frac{dx}{x \tan^{-1} x}$

   (f) $\displaystyle\int_{3}^{\infty} \frac{2x^2 + 3x}{\sqrt{1 + x^5}} dx$

2. Determine whether the integral $\displaystyle\int_{1}^{\infty} \frac{\sin^2 x}{x\sqrt{x}}$ converges or diverges by using

   (a) The Limit Comparison Test

   (b) The regular Comparison Test

   (c) Which is easier for problems like this?

**Integration Practice**

1. Find each of the following integrals. Be sure to work as a group so **everyone** knows how to do all these problems.

   (a) $\displaystyle\int e^{x+e^x} dx$

   (b) $\displaystyle\int \frac{\sec^2(\sin\theta)}{\sec\theta} d\theta$

   (c) $\displaystyle\int \frac{1}{\sqrt{x+1} + \sqrt{x}} dx$

   (d) $\displaystyle\int \frac{\ln(x+1)}{x^2} dx$

   (e) $\displaystyle\int \frac{t^3 + 1}{t^3 - t^2} dt$

   (f) $\displaystyle\int \cos^4 t - \sin^4 t dt$

   (g) $\displaystyle\int \cos^3 2x \sin 2x dx$

   (h) $\displaystyle\int \frac{dt}{\sqrt{e^t}}$

   (i) $\displaystyle\int \frac{1}{x\sqrt{x^2+4}} dx$

   (j) $\displaystyle\int \frac{1}{x\sqrt{x+4}} dx$

   (k) $\displaystyle\int \frac{x}{\sqrt{x^2+4}} dx$

   (l) $\displaystyle\int \frac{1}{\sqrt[4]{x} + \sqrt[3]{x}}$

   (m) $\displaystyle\int \ln(\sec\theta) \sec^2\theta d\theta$