Calculus II
Homework
Improper integrals

1. Determine whether the integral is convergent or divergent. Motivate your answer.

(a) $\displaystyle\int_2^\infty \frac{1}{(x-1)^{\frac{3}{2}}}\,\mathrm{d}x.$

(b) $\displaystyle\int_{-1}^1 \frac{1}{\sqrt[5]{1+x}}\,\mathrm{d}x.$

(c) $\displaystyle\int_1^\infty \frac{1}{\sqrt[5]{1+x}}\,\mathrm{d}x.$

(d) $\displaystyle\int_{-1}^\infty \frac{1}{\sqrt[5]{1+x}}\,\mathrm{d}x.$

(e) $\displaystyle\int_{-\infty}^0 \frac{1}{2-3x}\,\mathrm{d}x.$

(f) $\displaystyle\int_{-\infty}^0 \frac{1}{(2-3x)^2}\,\mathrm{d}x.$

(g) $\displaystyle\int_{-\infty}^0 \frac{1}{(2-3x)^{1.00000001}}\,\mathrm{d}x.$

(h) $\displaystyle\int_{-2}^{\frac{1}{2}} \frac{1}{2x-1}\,\mathrm{d}x.$

(i) $\displaystyle\int_{-1}^\infty e^{-3x}\,\mathrm{d}x.$

(j) $\displaystyle\int_{-\infty}^5 2^x\,\mathrm{d}x.$

(k) $\displaystyle\int_{-\infty}^\infty x^3\,\mathrm{d}x.$

(l) $\displaystyle\int_{-\infty}^\infty x e^{-x^2}\,\mathrm{d}x.$

(m) $\displaystyle\int_0^\infty \sqrt{x}\,e^{-\sqrt{x}}\,\mathrm{d}x.$

(n) $\displaystyle\int_0^\infty \sin^2 x\,\mathrm{d}x.$

(o) $\displaystyle\int_0^5 \frac{1}{x^2+x-2}\,\mathrm{d}x.$

(p) $\displaystyle\int_0^\infty \frac{1}{x^2+x+1}\,\mathrm{d}x.$

(q) $\displaystyle\int_2^\infty \frac{1}{x^2-x-1}\,\mathrm{d}x.$

(r) $\displaystyle\int_0^\infty \frac{1}{x^2-x-1}\,\mathrm{d}x.$

(s) $\displaystyle\int_{-\infty}^\infty \frac{x^2}{x^4+2}\,\mathrm{d}x.$

(t) $\displaystyle\int_{100}^\infty \frac{1}{x\ln x}\,\mathrm{d}x.$

(u) $\displaystyle\int_{100}^\infty \frac{1}{x(\ln x)^2}\,\mathrm{d}x.$

(v) $\displaystyle\int_0^1 \ln x\,\mathrm{d}x.$

(w) $\displaystyle\int_0^1 \frac{\ln x}{\sqrt{x}}\,\mathrm{d}x.$

(x) $\displaystyle\int_0^2 x^3 \ln x\,\mathrm{d}x.$

(y) $\displaystyle\int_0^1 \frac{e^{\frac{1}{x}}}{x^2}\,\mathrm{d}x.$

(z) $\displaystyle\int_{-1}^0 \frac{e^{\frac{1}{x}}}{x^2}\,\mathrm{d}x.$

2. Determine whether the integral is convergent or divergent. Motivate your answer. The answer key has not been proofread, use with caution.

(a) $\displaystyle\int_0^\infty \sin x^2 \mathrm{d}x$ (This problem is more difficult and may require knowledge of sequences to solve).