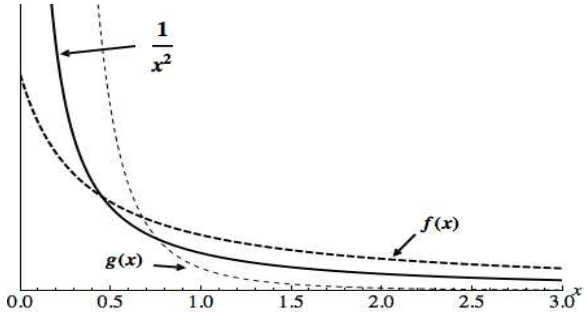
4. [13 points]

a. [8 points] Consider the functions $f(x)$ and $g(x)$ where

$$\frac{1}{x^2} \leq g(x) \quad \text{for} \quad 0 < x < \frac{1}{2}.$$

$$g(x) \leq \frac{1}{x^2} \quad \text{for} \quad 1 < x$$

$$\frac{1}{x^2} \leq f(x) \quad \text{for} \quad 1 < x.$$



Using the information about $f(x)$ and $g(x)$ provided above, determine which of the following integrals is convergent or divergent. Circle your answers. If there is not enough information given to determine the convergence or divergence of the integral circle NI.

i) $\displaystyle\int_1^\infty f(x)dx$ CONVERGENT DIVERGENT NI

ii) $\displaystyle\int_1^\infty g(x)dx$ CONVERGENT DIVERGENT NI

iii) $\displaystyle\int_0^1 f(x)dx$ CONVERGENT DIVERGENT NI

iv) $\displaystyle\int_0^1 g(x)dx$ CONVERGENT DIVERGENT NI

b. [5 points] Does $\displaystyle\int_e^\infty \frac{1}{x(\ln x)^2}dx$ converge or diverge? If the integral converges, compute its value. Show all your work. Use u substitution.