Mathematics IA Assignment 8

Semester 1, 2016
Submit solutions by 2pm Monday May 23rd
(together with solutions for Assignment 9)

Algebra

Determine whether the following vectors are linearly independent or dependent, giving full detail of working required including any matrix row operations used.

$$\left\{ \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}, \begin{pmatrix} -1 \\ -1 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 \\ 2 \\ 2 \end{pmatrix} \right\}$$

Calculus

Let $f(x) = \ln(x)/x^2$ defined for $x \geq 1$.

(a) Find the derivative of $f(x)$.

(b) Use the definition of $\ln(x)$ as an integral to show that $f(x) < \dfrac{1}{x}$ for all $x \geq 1$. (Hint: bound the integral with an upper sum)