Mathematics IB Assignment 4

Semester 2, 2016
Submit solutions by 2pm Monday 5th September
(together with solutions for Assignment 5)

Algebra

Let

$$\mathbf{u}_1 = (1, 0, 1, 0), \quad \mathbf{u}_2 = (0, 2, 0, 1), \quad \mathbf{u}_3 = (1, 2, 1, 0)$$

and let W be the subspace of $\mathbb{R}^4$ with basis $\{\mathbf{u}_1, \mathbf{u}_2, \mathbf{u}_3\}$.

Use the Gram–Schmidt process to find an orthonormal basis for W.

You must show all your working.

Calculus

Evaluate the following limits using only techniques from sections 2.1-2.6 of the lecture notes (i.e. not L'Hopital's Rule), showing details of your working.

(a) $\lim_{x \to -3} \left(\frac{1}{x} + \frac{1}{3}\right)\left(\frac{1}{x^3 - 9x}\right)$

(b) $\lim_{x \to 0} \frac{\tan 5x}{3x^2 + 7x}$