Solutions

MATH 54 – LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS QUIZ 5B

You have 20 minutes to complete the quiz.

1. (6 points) Apply the Gram-Schmidt process to these vectors to produce an orthogonal basis for $\mathbb{R}^3$. (note: you must use the Gram-Schmidt process to receive credit.)

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

$$V_1 = \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix}$$

$$V_2 = \begin{bmatrix} 2 \\ 0 \\ 0 \end{bmatrix} - \frac{2}{2} \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$$

$$\boxed{\left\{ \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} \right\}}$$

$$V_3 = \begin{bmatrix} 2 \\ 2 \\ 1 \end{bmatrix} - \frac{0}{\langle v_1, v_1 \rangle} \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix} - \frac{4}{2} \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

2. (4 points) Is the following a inner product on $\mathbb{P}_1$? $\langle p(t), q(t) \rangle = p(0)q(0)$. Why or why not?

No. $p(t) = t$

$$\langle p(t), p(t) \rangle = p(0)p(0) = 0$$

but $p(t) \neq 0$!