Math 311 Friday Sep 25

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No.

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x^2+2, x^2-x, x^2+x+1

Let $p(x) = Ax^2+Bx+C \in P_3$ & $\alpha, \beta, \gamma \in R$:

$\alpha(x^2+2)+\beta(x^2-x)+\gamma(x^2+x+1) = Ax^2+Bx+C$

$\alpha x^2+2\alpha+\beta x^2-\beta x+\gamma x^2+\gamma x+\gamma = Ax^2+Bx+C$

$x^2(\alpha+\beta+\gamma)+x(-\beta+\gamma)+(2\alpha+\gamma) = Ax^2+Bx+C$

$\Rightarrow A = \alpha+\beta+\gamma$ & $B = -\beta+\gamma$ & $C = 2\alpha+\gamma$

$$\begin{cases} A = \alpha+\beta+\gamma \\ B = -\beta+\gamma \\ C = 2\alpha+\gamma \end{cases} \Rightarrow \begin{cases} A+B = \alpha+2\gamma \\ B = -\beta+\gamma \\ C = 2\alpha+\gamma \end{cases} \Rightarrow \begin{cases} 2A+2B-C = 3\gamma \\ B = -\beta+\gamma \\ C = 2\alpha+\gamma \end{cases}$$

$$\Rightarrow \begin{cases} \gamma = \frac{2A+2B-C}{3} \\ B = -\beta+\frac{2A+2B-C}{3} \\ C = 2\alpha+\frac{2A+2B-C}{3} \end{cases} \Rightarrow \begin{cases} \gamma = \frac{2A+2B-C}{3} \\ \beta = \frac{2A+2B-C}{3}-B \\ \alpha = \frac{C}{2}-\frac{2A+2B-C}{6} \end{cases}$$

Since every $p(x) = Ax^2+Bx^2+C \in P_3$ can be written as linear combination of the given set, $\{x^2+2, x^2-x, x^2+x+1\}$ is the spanning set of P_3