*** * * NOTE! this quiz is TWO SIDED! * * ***

1. Consider the following vectors in $\mathbb{P}_4$: Let $\mathbf{v}_1 = 3\,x^4 + 5\,x^2 + 6$, $\mathbf{v}_2 = x^4 + 2\,x^2 + 3$ and $\mathbf{v}_3 = 5\,x^4 + 7\,x^2 + 4$.

Let $\mathbf{b}$ be the polynomial $49\,x^4 + 73\,x^2 + 58$.

1A) In terms of the unknowns α_1, α_2 and α_3, what system of equations do you need to set up to determine if $\mathbf{b}$ can be written as a linear combination $\alpha_1\mathbf{v}_1 + \alpha_2\mathbf{v}_2 + \alpha_3\mathbf{v}_3 = \mathbf{b}$?

1B) Now determine the values of α_1, α_2 and α_3 or explain why there are none. Show any RREF'd matrices you use.

1C) Without setting up any equations or finding any RREF's, give a quick reason why $\mathbf{c} = 5x^3 + 7x^2 + 11$ is obviously not a linear combination of of $\mathbf{v}_1$, $\mathbf{v}_2$ and $\mathbf{v}_3$.

*** * * * This quiz CONTINUES on the OTHER SIDE * * * ***

2. Let H be the set of functions in $\mathbf{F}$ whose graphs are completely above the horizontal line $y = 2$.

2A. Is $\mathbf{v}_1 = x^2 + 4$ in H? You can draw a graph of $\mathbf{v}_1$ (copy it here) to explain your answer.

2B. Is $\mathbf{v}_2 = 2 + \sin x$ in H? You can draw a graph of $\mathbf{v}_2$ (copy it here) to explain your answer.

2C. Explain informally why H is closed under the vector addition of $\mathbf{F}$ (hint: think about "addition of y-coordinates") or give an explicit counter example.

2D. Explain informally why H is closed under scalar multiplication (hint: think about "multiplying y-coordinates by any arbitrary scalar)" or give an explicit counter example that shows H is not closed under scalar multiplication.