MAT 310: HW3

(1) Recall that $C(R)$ denotes the vectors space of all continuous real valued functions defined on all of the real line.

(a) Show that the three functions x, x^2, e^x are independent vectors in $C(R)$. (**Hint:** take the derivative of a linear combination of these functions.)

(b) Show that the two functions $e^x, sin(x)$ are independent vectors in $C(R)$.

(2) Let F denote a field. Recall that $P_2(F)$ denotes the vector space of polynomials in one variable having degree less than or equal to 2 and with coefficients in F; and $\mathbb{F}(F, F)$ denotes the vector space of all maps $h : F \longrightarrow F$. Note that any polynomial $ax^2 + bx + c$ in $P_2(F)$ may also be regarded as the vector h in $\mathbb{F}(F, F)$ defined by $h(\alpha) = a\alpha^2 + b\alpha + c$ for each $\alpha \in F$.

(a) If F denotes the set of real numbers, then show that two polynonomials in $P_2(F)$ are linearly independent in $P_2(F)$ iff they are linearly independent in $\mathbb{F}(F, F)$.

(b) If F denotes the integers mod 2, then show that there are two polynomials in $P_2(F)$ which are independent in $P_2(F)$ but are not independent in $\mathbb{F}(F, F)$.

(3) In section 1.6 do problems #1,2(c)(e),3(a)(e),9,14,29,31.

(4) In section 2.1 do problems #1,5,6,9,11,14,28