King Fahd University of Petroleum and Minerals

Quiz 3 Math 260 Semester: 143 Duration: 50 minutes

Full Name: ID:

Section and Serial number:

Question 1 Show that the IVP below has a unique solution on $(-\frac{\pi}{4}, \frac{\pi}{4})$.

$$(\cos x)y'' + (\sin x)y' + \frac{y}{x+1} = \tan x \quad \text{with } \ y(0) = 1 \ \text{ and } \ y'(0) = 0\,.$$

Question 2 Let $W = \{(0,x,y,z,t) \in \mathrm{R}^5$ such that $x+y+2t = z+t = 0\}$. Find a basis of W and then, determine the dimension of W.

Question 3 Let $W_1 = \{A \in M_{2,2} \text{ with } A = 2A^T\}$ and $W_2 = \{A \in M_{2,2} \text{ with } A \neq 2A^T\}$ where $M_{2,2}$ is the set of all 2×2 real matrices. Determine if W_1 and W_2 are subspaces of $M_{2,2}$ or not. (Justify your answer)

Question 4 In each part, determine if the given functions are linearly dependent or independent on $(-\infty, \infty)$. (Justify your answer)

a) $g_1(x) = x^2$, $g_2(x) = x^2 + 2x$, $g_3(x) = (x+1)^2$

b) $f_1(x) = 1$, $f_2(x) = x+1$, $f_3(x) = (x+1)^2$, $f_4(x) = (x+1)^3$, $f_5(x) = x^3+3x^2+x-1$

Question 5 Solve the following DE:

$$D^2(D^3-3D-2)(D^2+2D+2)^2 y = 0\,.$$