King Fahd University of Petroleum & Minerals
Department of Mathematics and Statistics
MATH 280-01(Term 122)
Exam II

NAME: ....

ID #: . . . .

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Question	Score
1 (10 pts)	
2 (12 pts)	
3 (12 pts)	
4 (10 pts)	
5 (14 pts)	
6 (10 pts)	
7 (12 pts)	
8 (12 pts)	
9 (8 pts)	
Total (100)	

Q1. Let $L : \Re^2 \to \Re^2$ be a linear transformation and let A be the standard matrix representation of L. Define L^2 by $L^2(x) = L(L(x))$ for all $x \in \Re^2$. Show that L^2 is a linear transformation and its matrix representation is A^2

Q2. Let $L : P_3 \to P_3$ be a linear transformation defined by

$$L(p(x)) = xp'(x)$$

Find the kernel and range of L.

Q3. let

$$S = \{u_1 = \begin{bmatrix}1\\1\\1\end{bmatrix}, u_2 = \begin{bmatrix}1\\2\\-3\end{bmatrix}, u_3 = \begin{bmatrix}5\\-4\\-1\end{bmatrix}\}$$

(a) Show that S is orthogonal and S is a basis for $\Re^3$
(b) Write $(1, 5, -7)^T$ as a linear combination of u_1, u_2, u_3.

Q4. Find k so that $f(t) = t + k$ and $g(t) = t^2$ are orthogonal with $(f, g) = \int_0^1 f(t)g(t)dt$

Q5.Find an **orthonormal** basis for the subspace U of $\Re_4$ spanned by the vectors:

$$v_1 = (1, 1, 1, 1),\ v_2 = (1, 1, 2, 4),\ v_3 = (1, 2, -4, -3)$$

Q6. let w_1 and w_2 be two nonzero **orthogonal** vectors in V and let v be any vector in V. If $u = v - c_1 w_1 - c_2 w_2$ is **orthogonal** to w_1 and w_2 then find c_1 and c_2

Q7. Let $L : \Re^2 \to \Re^2$ be a linear transformation. Let $(1,2)^T, (0,1)^T$ be a basis for $\Re^2$. Suppose $L(1,2)^T = (2,3)^T$ and $L(0,1)^T = (1,4)^T$, find a formula for $L(a,b)^T$

Q8. Let u and v be any two vectors in an inner product space V.
(a) state the **Cauchy-Schwarz** inequality.
(b) state the **Triangle** inequality

Q9. **TRUE** or **FALSE**

a) (   )   Let $L : \Re^n \to \Re^2$ be a linear transformation. If $L(x_1) = L(x_2)$, then the vectors x_1 and x_2 must be equal

b) (   )   If $L : V \to V$ is a linear transformation and $x \in KerL$ then $L(v+x) = L(v)$ for all $v \in V$

c) (   )   Let $L : \Re^n \to \Re^n$ be a linear transformation. If A is the standard matrix representation of L, then an $n \times n$ matrix B will also be a matrix representation of L if and only if B is similar to A

d) (   )   Let A, B, and C be $n \times n$ matrices. If A is similar to B and B is similar to C, then A is similar to C.