CONCORDIA UNIVERSITY

Department of Mathematics & Statistics

Course	Number	9 8-4:-()
Mathematics	204	Section(s)
Examination	7	ALL (except EC)
	Date	Pages
Final	June 2016	
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Special Instructions

- Only approved calculators are allowed.
- Justify all your answers.
- All questions have equal value.
 - 1. Using Gauss-Jordan method, find all solutions of the following system of equations:

$$x_1 + 2x_2 + 2x_3 = 2$$

 $x_1 + 8x_3 + 5x_4 = -6$
 $x_1 + x_2 + 5x_3 + 5x_4 = 3$

- 2. Let $M = \begin{pmatrix} 1 & 1 & -1 \\ 2 & 0 & 1 \\ 1 & 1 & 0 \end{pmatrix}$.
 - (a) Find M^{-1} .
 - (b) Calculate the matrix C so that MC = B, where $B = \begin{pmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{pmatrix}$.
- 3. (a) Use Cramer's rule to solve the following system of equations:

- (b) Evaluate the determinant of the matrix $A = \begin{pmatrix} 1 & 2 & 0 & 1 \\ 2 & 3 & 1 & 2 \\ -1 & 1 & 1 & 1 \\ 2 & 1 & 2 & 4 \end{pmatrix}$
- 4. Let \mathcal{L} be the line with parametric equations x = 3 + t, y = 2 2t, z = 1 + 4t and let v = (1, 2, 3). Find vectors w_1 , w_2 such that $w_1 + w_2 = v$, and such that w_1 is parallel to \mathcal{L} and w_2 is perpendicular to \mathcal{L} .

- 5. Let $P_1(1,0,2)$, $P_2(2,1,0)$, and $P_3(0,2,1)$ be 3 points
 - (a) Find the area of a triangle with vertices P_1 , P_2 , P_3 .
 - (b) Find the equation of the plane containing P_1 , P_2 , P_3 .
- 6. Let \mathcal{L} be the line with parametric equations $x=3-t,\ y=2-t,\ z=4+t$ and let \mathcal{P} be the plane 2x+2y+4z=4
 - (a) Prove that $\mathcal L$ and $\mathcal P$ are parallel.
 - (b) Find the distance between \mathcal{L} and \mathcal{P} .
- 7. Let $v_1 = (1, 2, 0)$ and $v_2 = (2, 1, 0)$
 - (a) Find scalars a and b such that $av_1 + bv_2 = (-2, 3, 0)$.
 - (b) Find a vector v_3 such that v_1, v_2, v_3 are linearly independent.

8. Let
$$A = \begin{pmatrix} 1 & 2 & 0 & 0 & 3 & 7 \\ 0 & 0 & 1 & 0 & 1 & 4 \\ 0 & 0 & 0 & 1 & 1 & 2 \end{pmatrix}$$
 and $X = \begin{pmatrix} x \\ y \\ z \\ u \\ v \\ w \end{pmatrix}$. Find a basis for the solution

space of the homogeneous system AX = 0.

9. Let $A = \begin{pmatrix} 1 & 2 \\ 3 & 2 \end{pmatrix}$. Find all eigenvalues of A.

Is A diagonalizable? If yes, find P so that $P^{-1}AP = D$ diagonal.

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10. Let
$$A = \begin{pmatrix} 0 & -2 \\ 1 & 3 \end{pmatrix}$$
. Find A^{100} .

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