Math 226: Calculus IV Name:________________

Exam I *February 14, 1991* Score:________________

Record your answers to the multiple choice problems by placing an $\times$ through one letter for each problem on this answer sheet. There are 16 multiple choice questions worth 6 points each. You start with 4 points.

Let

$$= 201 - 631 \qquad = -115$$

Find -2. *Not defined* $40 - 1 - 6 - 71$ $221 - 83 - 9$ $4 - 1 - 7$ $2 - 89$

Calculate the matrix product

$$-1023112 - 10 - 140$$

$6110 - 4$ $-200 - 1$ $6101 - 10$ $-200 - 1120$ *Not defined*

Which of the following matrices are in row-echelon form?

$$= 1 - 21000000001 \qquad = 00121 - 310 \qquad = 010 - 1001200010000$$

$$= 0102 \qquad = 100000000$$

and only only , , and only , , , and only , , , , and

Translate the following system of equations into an augmented matrix.

$$x_1 - x_2 + x_4 = 5$$
$$2x_2 + x_3 = -3$$
$$x_1 - x_3 + 2x_4 = 1$$
$$x_2 - x_4 = 0$$

$1 - 101 : 50210 : -310 - 12 : 1010 - 1 : 0$ $1 - 11 : 5210 : -31 - 12 : 11 - 10 : 0$ $1 - 110211 - 1201 - 1$ $1 - 101021010 - 12010$
$1 - 110 : 50210 : -31 - 120 : 101 - 11 : 0$

Which of the following is the general solution of the system of equations associated to the augmented matrix

$$11 - 104 : 000153 : 10001 - 2 : 2$$

Sys-

$x_1 = -9 - x_2 - 17x_5$	$x_1 = -x_2 - 4x_5$	$x_1 = 0$	$x_1 = -x_2 + x_3 - 4x_5$
$x_3 = -9 - 13x_5$	$x_3 = 1 - 3x_5$	$x_3 = 1$	$x_3 = 1 - 5x_4 + 3x_5$
$x_4 = 2 + 2x_5$	$x_4 = 2 + 2x_5$	$x_4 = 2$	$x_4 = 2 - 2x_5$

tem is inconsistent

Transform the following matrix into row-echelon form without exchanging any rows.

$$12032516120437110$$

1203011000010000 1203011000110001 1203001100010000 1203010100010000 1000010000100000

Find the inverse of the following matrix, if it exists.

$$123012101$$

$\frac{1}{2}1 - 212 - 2 - 2 - 121$ $\frac{1}{2}11 - 30 - 20101$ $1 - 2301 - 2001$ $\frac{1}{2}-31111 - 20 - 11$ *Does not exist*

Calculate the determinant of the matrix

$$1 - 11 - 21 - 21 - 31$$

0 6 12 -6 -12

Use expansion by cofactors to calculate the determinant of the matrix

$$2 - 13061 - 1503004002$$

-60 30 -15 120 0

Calculate the (2,3)-cofactor, $A_{(2,3)}$, of the matrix

$$= 5712621420$$

-13 -8 16 4 0

Which of the following statements are always true:

(A) If $_1$, $_2$, $_3$, $_4$ are linearly dependent, then there are **no** scalars c_1, c_2, c_3, and c_4, not all zero, such that $c_{11} + c_{22} + c_{33} + c_{44} = 0$.

(B) If $_1$, $_2$, $_3$, and $_4$ are linearly independent, then $_1$ is **not** a linear combination of $_2$, $_3$, and $_4$.

(C) If $_1$, $_2$, and $_3$ are 2-dimensional vectors, then they are linearly dependent.

(D) If $_1$, $_2$,and $_3$ are linearly independent, then $_1$, $_2$, $_3$, and $_4$ are linearly independent.

B and C only A, C, and D only B, C, and D only A, and D only A, B, C, and D

Find all solutions to the equation = where

$$= 1 - 1 - 1 - 11 - 1 - 1 - 11, \quad = x_1x_2x_3, \quad = -242$$

$= -30 - 1 = -20 - 1 = -242 = -31 - 2$ *No solution exists*

Determine a maximal subset of linearly independent vectors from the vectors

$$_1 = [0,1,0,0] \quad _2 = [1,1,1,1] \quad _3 = [0,1,1,1] \quad _4 = [1,1,0,0]$$

$_1$, $_2$, $_3$ $_1$ $_1$, $_2$ $_3$, $_4$ $_1$, $_2$, $_3$, $_4$

Use the Gram-Schmidt process to produce an orthonormal set of vectors from the following vectors: $_1 = [0,-1,0,1]$, $_2 = [0,1,1,-1]$, $_3 = [1,1,-1,0]$.

$$_1 = \frac{1}{\sqrt{2}}[0,-1,0,1] \quad _2 = [0,0,1,0] \quad _3 = \sqrt{\frac{2}{3}}[1,\frac{1}{2},0,\frac{1}{2}]$$

$$_1 = [0,-1,0,1] \quad _2 = [0,0,1,0] \quad _3 = [2,1,0,1]$$

$$_1 = [1,0,0,0] \quad _2 = [0,1,0,0] \quad _3 = [0,0,1,0]$$

$$_1 = \frac{1}{\sqrt{2}}[0,-1,0,1] \quad _2 = \frac{1}{\sqrt{3}}[0,1,1,-1] \quad _3 = \frac{1}{\sqrt{3}}[1,1,-1,0]$$

$$_1 = \frac{1}{\sqrt{2}}[0,-1,0,1] \quad _2 = \frac{1}{3}[0,2,1,-2] \quad _3 = \frac{1}{\sqrt{2}}[1,1,0,0]$$

Find the general solution to the differential equation

$$x^2y' + y = e^{\frac{1}{x}}, \quad x > 0$$

$y = ce^{\frac{1}{x}} - \frac{1}{x}e^{\frac{1}{x}}$ $y = -\frac{c}{x^2}e^{\frac{1}{x}} - \frac{1}{x}$ $y = ce^{\frac{1}{x}} - \frac{1}{x}$ $y = \frac{c}{x}e^{-\frac{1}{x}} + e^{\frac{1}{x}}$ $y = \frac{c}{x} - e^{-\frac{1}{x}}$

On which of the following intervals does a unique solution exists to the initial value problem

$$(x^2 - 2x)y' + xy = \cos(x), \quad y(1) = 0$$

$(0,2)$ $(-\infty,2)$ $(0,\infty)$ $(-\infty,\infty)$ *A unique solution does not exist*