Math 226: Calculus IV Name:________________________

Exam I *February 13, 1992* 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 15 multiple choice questions worth 6 points each. You start with 10 points.

Let = 10 − 10203 − 14 and = −23042 − 10 − 11. Compute 2−. 4 − 3 − 2 − 4216 − 17 24 − 184 − 2 − 1035 48 − 2168 − 4 − 20610 −23142 − 12 − 21 03 − 246 − 16 − 39

Let = 1 − 131 − 1320 and = 1 − 12 − 121. Compute the matrix product . 2 − 312 − 17 − 4712 − 24 112 − 321 − 130200 22 − 42 − 3 − 17 − 21714 1 − 3 − 1212302100 *Not defined.*

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

= 0
0
1
−1
0
1
0
1
1
0
0
0

= 0 1 0 2 0 0 1 1 = 1 1 0 0 0 0 1 1 0 0 0 1 = 1 0 0 2 = 0 0 0 0 1 0 0 0 0

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

Translate the following system of linear equations into an augmented matrix.

$$x_1 - x_3 + 4x_4 - x_5 = 7$$
$$x_2 - x_3 + 2x_4 + 6x_5 = 1$$
$$2x_1 + 5x_2 + x_3 - 3x_5 = 4$$

10 − 14 − 1 : 701 − 126 : 12510 − 3 : 4 1 − 14 − 1 : 712 − 16 : 1251 − 3 : 4 102 : 7015 : 1 − 1 − 11 : 4420 : 0 − 16 − 3 : 0 1 − 14 − 112 − 16251 − 3 102015 − 1 − 11420 − 163

Find the general solution to the system of equations associated to the augmented matrix

12 − 11 : 20112 : 00001 : −1

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

Solve the system of equations defined by = where

= 10 − 111 − 11 − 10 $= x_1x_2x_3$ = 123

$x_1 = 4$ $x_1 = 3$ $x_1 = -2$ $x_1 = -1$ *No solution exists*
$x_2 = 1$ $x_2 = 1$ $x_2 = 1$ $x_2 = 1$
$x_3 = 3$ $x_3 = 2$ $x_3 = -3$ $x_3 = -2$

Find the inverse of the matrix

101100011

010 − 1111 − 10 10 − 1 − 1000 − 11 001 − 11210 − 1 11 − 10100 − 11 0 − 1101012 − 1

Reduce the following matrix to echelon form without exchanging any rows.

12031241541212336277

12031001 − 120000000000 120310112300123000000 120310001 − 10000000000 12031001 − 130001100000 120310000000000000000

Which of the following gives the determinant of the matrix

61 − 214 − 319010 − 21 − 781

2 det 61 − 24 − 311 − 78−det 6 − 21419181 6 det −31910 − 2 − 781 6 det −31910 − 2 − 781+det 41900 − 2181−
2 det 4 − 390101 − 78 det 1 − 21 − 31910 − 2 + 4 det 1 − 2110 − 2 − 781 *None of the above*

Calculate the determinant of the matrix

1234212332124321

−20 −80 40 120 0

If c_1, c_2, and c_3 are constants such that $B = [5, 7, 2]$ is a linear combination, $B = c_1V_1 + c_2V_2 + c_3V_3$, of the vectors $V_1 = [1, 0, 0]$, $V_2 = [1, 1, 0]$, and $V_3 = [1, 1, 1]$, then $c_1 = -2$ $c_1 = 5$ $c_1 = 0$ $c_1 = 3$ *No such constants exist*

Determine a maximal subset of linearly independent vectors from the set of vectors

$$_1 = [1, 2, 3, 5], \qquad _2 = [0, 0, 0, 0], \qquad _3 = [1, 3, 2, 5],$$
$$_4 = [2, 3, 7, 10], \qquad _5 = [0, 1, -1, 0]$$

1, 3 1, 3, 5 1, 3, 4, 5 1, 3, 4 1, 2, 3

Find an orthonormal set of vectors from the following vectors using the Gram-Schmidt method.

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

$_1 = \frac{1}{\sqrt{2}}[1, 0, 0, 1]$
$_2 = \frac{1}{\sqrt{6}}[1, 0, 2, -1]$
$_3 = \frac{1}{2\sqrt{3}}[-1, 3, 1, 1]$
$_1 = \frac{1}{\sqrt{2}}[1, 0, 0, 1]$
$_2 = \frac{1}{\sqrt{2}}[1, 0, 1, 0]$
$_3 = \frac{1}{2}[1, 1, -1, -1]$
$_1 = \frac{1}{\sqrt{2}}[1, 0, 0, 1]$
$_2 = \frac{1}{\sqrt{6}}[1, 0, 2, -1]$
$_3 = \frac{1}{\sqrt{3}}[-1, 0, 1, 1]$
$_1 = \frac{1}{\sqrt{2}}[1, 0, 0, 1]$
$_2 = \frac{1}{\sqrt{7}}[1, 2, -1, -1]$
$_3 = \frac{1}{\sqrt{7}}[1, 1, 2, -1]$
$_1 = \frac{1}{\sqrt{2}}[1, 0, 0, 1]$
$_2 = \frac{1}{\sqrt{6}}[1, 1, 2, -1]$
$_3 = \frac{1}{\sqrt{14}}[1, 3, -2, 0]$

Determine the general solution of the differential equation

$$y' - \frac{1}{x}y = x^2$$

$y = \frac{1}{2}x^3 + cx$ $y = \ln(x) + \frac{1}{3}x^3 + c$ $y = \frac{1}{3}x^4 + \frac{c}{x}$ $y = e^{1/x}x^2 + ce^{1/x}$ $y = \frac{1}{3}x^3e^{-1/x} + ce^{-1/x}$

Find the interval on which a unique solution to the following initial value problem exists.

$$\cos(x)y' + \sin(x)y = e^x, \qquad y(0) = 1$$

$(-\pi/2, \pi/2)$ $(-\pi, \pi)$ $(-2\pi, 2\pi)$ $(-\infty, \infty)$ $(0, \pi)$