SARDAR VALLABHBHAI PATEL INSTITUTE OF TECHNOLOGY VASAD

B. E. Second Semester (All Branch)

Subject: Vector Calculus and Linear Algebra (2110015)

Year 2016-2017

Tutorial: 01

1 **Which of the following matrices are in row echelon form?**

$\begin{bmatrix}1&0&0\\0&1&0\\0&0&1\end{bmatrix}$ $\begin{bmatrix}1&2&0\\0&1&0\\0&0&0\end{bmatrix}$ $\begin{bmatrix}1&0&0\\0&1&0\\0&2&0\end{bmatrix}$ $\begin{bmatrix}0&0&0\\1&0&0\\0&1&0\end{bmatrix}$

2 (a) **Which of the following matrices are in reduced row echelon form?**

$\begin{bmatrix}0&1&0\\0&0&1\\0&0&0\end{bmatrix}$ $\begin{bmatrix}0&0&0\\0&0&0\\0&0&0\end{bmatrix}$ $\begin{bmatrix}1&0&1\\0&1&1\\0&0&0\end{bmatrix}$

(b) **Reduce to echelon form**

(1) $\begin{bmatrix}2&1&3\\0&-2&-29\\3&4&5\end{bmatrix}$ (2) $\begin{bmatrix}2&1&-1\\1&-1&2\\-1&2&-1\end{bmatrix}$

3 **Solve each of the following systems by Gaussian elimination.**

(1) $2\sin x-\cos y+3\tan z=3$
$4\sin x+2\cos y-2\tan z=2$
$6\sin x-3\cos y+\tan z=9$
$0\le x\le 2\pi,\ 0\le y\le 2\pi$
$and\ 0\le z<\pi$

(2) $x_1+x_2+x_3=9$
$2x_1+4x_2-3x_3=1$
$3x_1+6x_2-5x_3=0$

(3) $\frac{-1}{x}+\frac{3}{y}+\frac{4}{z}=30$
$\frac{3}{x}+\frac{2}{y}-\frac{1}{z}=9$
$\frac{2}{x}-\frac{1}{y}+\frac{2}{z}=10$

4 **Solve each of the following systems by Gauss-Jordan elimination.**

(1) $w+2x-y=4$
$x-y=3$
$w+3x-2y=7$
$2u+4v+w+7x=7$

(2) $x_1+3x_2-2x_3+2x_5=0$
$2x_1+6x_2-5x_3-2x_4+4x_5-3x_6=1$
$5x_3+10x_4+15x_6=5$
$2x_1+6x_2+8x_4+4x_5+18x_6=6$

(3) $x_1-2x_2+x_3-4x_4=1$
$x_1+3x_2+7x_3+2x_4=2$
$x_1-12x_2-11x_3-16x_4=5$

(4) $-2b+3c=1$
$3a+6b-3c=-2$
$6a+6b+3c=5$

5 **Solve the following homogeneous systems of linear equations by any method.**

(1) $2x-y-3z=0$
$-x+2y-3z=0$
$x+y+4z=0$

(2) $2x_1+x_2+3x_3=0$
$x_1+2x_2=0$
$x_2+x_3=0$

(3) $q+r+s=0$
$-m-p+2q-3r+s=0$
$m+p-2q-s=0$
$2m+2p-q+s=0$

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6 **For which values of *a* will the following system have no solutions? Exactly one solution? Infinitely many solutions?**

$x + 2y - 3z = 4$

$3x - y + 5z = 2$

$4x + y + (a^2 - 14)z = a + 2$

7 **For which value(s) of λ does the system of equations**

$(\lambda - 3)x + y = 0$

$x + (\lambda - 3)y = 0$

have nontrivial solutions?