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## COT 4500 Quiz #6 Solutions 4/6/2012

$$1) \begin{bmatrix} 1 & 3 & 5 & : & 7 \\ 2 & -1 & 1 & : & 10 \\ 5 & 2 & -4 & : & 34 \end{bmatrix}$$

$$\downarrow \begin{bmatrix} 1 & 3 & 5 & : & 7 \\ 0 & -7 & -9 & : & -4 \\ 0 & -13 & -29 & : & -1 \end{bmatrix}$$

$$(10pts) \downarrow \begin{bmatrix} 1 & 3 & 5 & : & 7 \\ 0 & -7 & -9 & : & -4 \\ 0 & 0 & -\frac{86}{7} & : & \frac{45}{7} \end{bmatrix}$$

$$\downarrow \begin{bmatrix} 1 & 3 & 5 & : & 7 \\ 0 & -7 & -9 & : & -4 \\ 0 & 0 & 1 & : & -\frac{45}{86} \end{bmatrix} \quad (5pts)$$

$$-7y - 9\left(-\frac{45}{86}\right) = -4$$

$$-7y = -4 - \frac{405}{86}$$

$$y = \frac{4}{7} + \frac{405}{602}$$

$$(5pts) = \frac{344 + 405}{602} = \frac{749}{602} = \frac{107}{86}$$

$$x + 3\left(\frac{107}{86}\right) + 5\left(-\frac{45}{86}\right) = 7$$

$$(5pts) x = \frac{-225 - 321}{86} + 7 = \frac{506}{86}$$

$$\boxed{\text{Soln } x = \frac{506}{86}, y = \frac{107}{86}, z = -\frac{45}{86}}$$

$$2) \begin{bmatrix} 3 & -4 & 5 & : & 5 \\ 6 & -8 & 2 & : & -2 \\ 4 & 5 & 6 & : & 16 \end{bmatrix}$$

$$\downarrow \begin{bmatrix} 3 & -4 & 5 & : & 5 \\ 0 & 0 & -8 & : & -12 \\ 0 & \frac{31}{3} & -\frac{2}{3} & : & \frac{28}{3} \end{bmatrix}$$

(10pts)

$$\downarrow \begin{bmatrix} 3 & -4 & 5 & : & 5 \\ 0 & \frac{31}{3} & -\frac{2}{3} & : & \frac{28}{3} \\ 0 & 0 & -8 & : & -12 \end{bmatrix}$$

(5pts)

$$z = \frac{3}{2} \quad (5pts)$$

$$31y - 2\left(\frac{3}{2}\right) = 28$$

$$y = 1 \quad (5pts)$$

$$3x - 4(1) + 5\left(\frac{3}{2}\right) = 5$$

$$3x = \frac{3}{2}$$

$$x = \frac{1}{2} \quad (5pts)$$

$$\boxed{\text{So, } x = \frac{1}{2}, y = 1, z = \frac{3}{2}}$$

(2)

$$3) \left[ \begin{array}{ccc|ccc} 2 & -3 & 1 & 1 & 0 & 0 \\ 2 & 2 & 1 & 0 & 1 & 0 \\ 5 & 0 & 3 & 0 & 0 & 1 \end{array} \right]$$

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$$\left[ \begin{array}{ccc|ccc} 2 & -3 & 1 & 1 & 0 & 0 \\ 0 & 5 & 0 & -1 & 1 & 0 \\ 0 & \frac{15}{2} & \frac{1}{2} & -\frac{5}{2} & 0 & 1 \end{array} \right]$$

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$$(10 \text{ pts}) \left[ \begin{array}{ccc|ccc} 2 & -3 & 1 & 1 & 0 & 0 \\ 0 & 5 & 0 & -1 & 1 & 0 \\ 0 & 0 & \frac{1}{2} & -1 & -\frac{3}{2} & 1 \end{array} \right]$$

$$\left[ \begin{array}{ccc|ccc} 2 & -3 & 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & -\frac{1}{5} & \frac{1}{5} & 0 \\ 0 & 0 & 1 & -2 & -3 & 2 \end{array} \right]$$

$$\left[ \begin{array}{ccc|ccc} 2 & -3 & 0 & 3 & 3 & -2 \\ 0 & 1 & 0 & -\frac{1}{5} & \frac{1}{5} & 0 \\ 0 & 0 & 1 & -2 & -3 & 2 \end{array} \right] (10 \text{ pts})$$

$$\left[ \begin{array}{ccc|ccc} 1 & 0 & 0 & \frac{6}{5} & \frac{9}{5} & -1 \\ 0 & 1 & 0 & -\frac{1}{5} & \frac{1}{5} & 0 \\ 0 & 0 & 1 & -2 & -3 & 2 \end{array} \right]$$

(5 pts)

4)

$$\begin{vmatrix} x & -4 & -1 \\ -5 & 2 & x \\ -1 & -8 & x \end{vmatrix}$$

$$= 2x^2 + 4x - 40 - 2 + 8x^2 - 20x$$

$$= 10x^2 - 16x - 42 \quad (15 \text{ pts})$$

Let  $10x^2 - 16x - 42 = 0$ , so matrix is singular.

$$(5x+7)(2x-6) = 0$$

$$\boxed{x = -\frac{7}{5} \text{ or } x = 3} \quad (10 \text{ pts})$$