MA1S12 Group A2 Quiz 05 11am 22/2/18 ANSWERS

Rules and procedures: UNCHANGED

(1) Calculate the linear least-squared-error estimate of the following data points.

$$(-2,4)(0,1)(1,3)(2,6)$$

(2) Calculate the quadratic least-squared-error estimate of the same data points.

Answer.

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A^T A, A^T Y are
   33    1    9,   43
    1    9    1,    7
    9    1    4,   14

det A^T A is 440
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$$m = 2/5, c = 17/5$$
$$y = .4x + 3.4$$
$$a = 21/22, b = 59/110, c = 67/55$$
$$y = 21x^2/22 + 59x/110 + 67/55$$

(3) Let

$$X_1 = \begin{bmatrix} -2 \\ -1 \\ 0 \end{bmatrix}, \quad X_2 = \begin{bmatrix} -6 \\ -3 \\ 1 \end{bmatrix}, \quad X_3 = \begin{bmatrix} -6 \\ -4 \\ 1 \end{bmatrix}, \quad X_4 = \begin{bmatrix} -44 \\ -25 \\ 7 \end{bmatrix}$$

Given that X_4 contains the *new* coordinates of a point with respect to the ordered basis X_1, X_2, X_3, find the old (standard) coordinates.

(4) Given that X_4 contains the *old* (standard) coordinates of a point, find its new coordinates.

Answer.

```
Reduced Row-Echelon Form:
 1 0 0 1
 0 1 0 4
 0 0 1 3
```

Answers to (3) and (4)

$$\begin{bmatrix} 196 \\ 91 \\ -18 \end{bmatrix} \begin{bmatrix} 1 \\ 4 \\ 3 \end{bmatrix}$$

(5) Compute the 3×3 matrix for perpendicular projection onto the plane $3x+4y+12z = 0$.

Answer.

$$\begin{bmatrix} \frac{10}{13} & -\frac{4}{13} & -\frac{12}{13} \\ -\frac{3}{13} & \frac{9}{13} & -\frac{12}{13} \\ -\frac{3}{13} & -\frac{4}{13} & \frac{1}{13} \end{bmatrix}$$