Name:_____

ChBE 2120, Numerical Methods, Paravastu Section, Fall 2015

Quiz 6: 20 points possible

1) (10 points) Setup the matrix equation necessary to perform a second order polynomial regression ($y = a_0 + a_1x + a_2x^2$) on the following data. Use the General least squares regression approach. You do not need to solve this question.

x	y
2	1
4	50
6	100
8	200

General Least Squares

Best-fit function: $y = a_0z_0 + a_1z_1 + a_2z_2 + \cdots + a_mz_m$, where $z_i's$ are any functions of x.

Minimization of S_r: $[Z]^T[Z][A] = [Z]^T[Y]$

$$[Z] = \begin{bmatrix} z_{01} & \cdots & z_{m1} \\ \vdots & \ddots & \vdots \\ z_{0n} & \cdots & z_{mn} \end{bmatrix}, z_{ij} = z_i(x_j), [Y] = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{bmatrix}, [A] = \begin{bmatrix} a_1 \\ a_2 \\ \vdots \\ a_m \end{bmatrix}$$

2) (10 points) Derive the matrix equation used to calculate the slope and intercept of the least-squares best-fit line for a data set. Recall that least-squares regression involves minimizing $S_r = \sum_{i=1}^{n} e_i^2 = \sum_{i=1}^{n}(y_i - a_0 - a_1x_i)^2$.