Simple Linear Regression Model Examples

1: Use Minitab to verify our estimates of $\hat{\beta}_0$ and $\hat{\beta}_1$ computed using the formula $\hat{\beta} = (X'X)^{-1}X'\vec{Y}$ as follows:

i. Enter the data {(-1,1), (0,2), (1,4)} into two columns in the data sheet named "x" and "y."

ii. Compute the least squares coefficient estimates (and other quantities) by

1. Accessing the regression menu via

   `Stat -> Regression -> Regression -> Fit Regression Model`

2. Selecting column "y" for the `Responses` variable and "x" for the `Continuous predictors` variable then clicking `OK`.

You should see the following toward the bottom of the output in the Minitab session window:

```
Coefficients

Term       Coef  SE Coef  T-Value  P-Value   VIF
Constant  2.333    0.236     9.90    0.064
x         1.500    0.289     5.20    0.121  1.00


Regression Equation

y = 2.333 + 1.500 x
```

Note that Minitab provides the least squares estimates $\hat{\beta}_0$ and $\hat{\beta}_1$ in two places: under the `Coef` column in the coefficient table and in the regression model.

2: Duplicate the book's regression analysis of the oxygen purity data by clicking on the link *hydrocarbon_purity.MTW* at the bottom of the course website:

`www.rose-hulman.edu/class/ma/inlow/Math383`

and then using Minitab's regression procedure. Here we want to model the effect of hydrocarbons in the main condenser of the distillation unit on the purity of oxygen produced. Thus oxygen purity (y) is the response variable and hydrocarbon level (x) is the predictor variable. Note that the book's Minitab output and yours have a different format due to Minitab 16 vs. 17 differences. Compare your estimates of $\hat{\beta}_0$ and $\hat{\beta}_1$ with those in the book.