Geophysics 4133
Gravity Reduction
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Name: _____

For each of the following problems neatly show all steps of your work (partial credit may be given if your work can be easily followed). Clearly indicate your final answers and answer all parts of the question including the 'describe' and 'why' questions.

1. The table below shows data collected along a north-south gravity profile. Distances are measured from the south end of the profile, whose latitude is 51.2067^o N. The calibration constant for the Worden gravimeter used for the survey is 3.972 gu per dial unit. Before, during, and after the survey, readings (labeled BS) were taken at a base station to monitor drift. The observed value of alsolute gravity at the base station is 9811424.2 gu.

Station	Time	Distance [m]	Elevation [m]	Reading [du]
BS	0805			2934.2
1	0835	0	84.26	2946.3
2	0844	20	86.85	2941.0
3	0855	40	89.43	2935.7
4	0903	60	93.08	2930.4
BS	0940			2934.7
5	1024	80	100.37	2926.6
6	1033	100	100.91	2927.9
7	1044	120	103.22	2920.0
8	1053	140	107.35	2915.1
BS	1145			2935.2
9	1232	160	110.10	2911.5
10	1242	180	114.89	2907.2
11	1300	200	118.96	2904.0
BS	1350			2935.5

   a) Drift correct the data and calculate the Bouguer and Free-Air anomaly values at each gravity station. Use a Bouguer reduction density of 2.670 Mg/m^3. Use a spreadsheet to do this if possible. You'll save time.

   b) Construct a series of graphs illustrating the vaiation in topography, observed gravity (use Δg), Free-Air anomaly, and Bouguer anomaly along the survey line. [Hint: Use a secondary y-axis to plot topographic elevation.] Why is there an inverse relationship between elevation and Δg?

   c) Using the data from the base station (BS), determine the error associated with reading the gravimeter. Calculate standard error of the estimate of the mean. ($S_e = \sqrt{\frac{\sigma^2}{n}}$ where $\sigma^2 = \frac{\sum_{j=1}^{n}(X_j-\mu)^2}{n}$; μ is the mean and n is the number of observations.)