

**Gravity Surveys** The table below shows data collected along a east-west gravity profile. Distances are measured from the west end of the profile, which has a latitude of  $51^{\circ}12'24''\text{N}$ . The density of the rock at the surface is  $\rho = 2.7 \text{ Mg/m}^3$ . The calibration constant of the Worden gravimeter used during the survey is 0.3792 mgal per dial unit. Before, during and after the survey, base station measurements (marked BS in the table) were taken. The known absolute value of gravity at the base station 981144.22 mgal.

1. Make a list of describing each step required to transform the raw gravity measurements into the free-air and Bouguer anomaly profiles. For each step, briefly describe the equations used and why the step is required. [10 pts]
2. Perform gravity reduction of the survey data. In doing this make a table that shows the original data, and then separately lists the value of each correction in one column and then applies the correction in the next column (as done in class). Hint, convert times into minutes since the start of the survey, so that the first base station measurement is at 0 minutes, and the last base station measurement is at 345 minutes. Please turn in a clearly labeled final table. [20 pts]
3. Plot (or draw on graph paper) a series of profiles of distance versus topography, observed gravity (before and after drift-correction), free-air anomaly and bouguer anomaly along the profile (i.e., 6 profiles). [6 pts]
4. Using the plots made in the previous step, comment on how each correction changes the shape and magnitude of the profile and why. [5 pts]
5. Based on the Bouguer anomaly, what do you know about the density anomalies in the subsurface? [4 pts]

Survey Data

Station	Time	Distance (m)	Elevation (m)	Reading
BS	08:05			2934.2
1	08:35	0	84.26	2946.3
2	08:44	20	86.85	2941.0
3	08:55	40	89.34	2935.7
4	09:03	60	93.08	2930.4
BS	09:40			2934.7
1	10:09			2946.3
5	10:24	80	100.37	2926.6
6	10:33	100	100.91	2927.9
7	10:44	120	103.22	2920.0
8	10:53	140	107.35	2915.1
BS	11:45			2935.2
9	12:32	160	110.10	2911.5
10	12:42	180	114.89	2907.2
11	13:00	200	118.96	2904.0
BS	13:50			2935.5