

**Inverse Theory Homework**  
**Due on Friday, April 21, 2006.**

Show your work. Turn in your codes as well as solutions and discussion.

1a) Fit a parabola to the following set of points: (0,1), (3,5), (5,7), (7,6), (9,5). Use least squares to determine estimates of the model parameters. Draw a picture to show the data points and the estimated parabola.

1b) Estimate the data variance as  $\sigma^2 = (\sum r_i^2)/n$ , with  $r_i$  being the residual between the observed and predicted data and  $n=5-3$ .

1c) Find the covariance matrix for the model parameters

1d) Assume the uncertainties on the data points are .2, .3, .1, .3, .4. Calculate new estimates of the model parameters using weighted least squares. Draw a picture to show the data points and the estimated parabola. How does the weighted solution compare to that found in (1a)?

1e) Constrain your inversion to go through the point (7,6). Draw a picture to show the data points and the estimated parabola. Compare to solutions from (1a) and (1d).

2. Extra credit. Aster Problem 6.1. Crosswell tomography – comparison of Kaczmarz, ART, SIRT. Matlab has functions for each of these algorithms (kac, art, sirt).