

# Math 452 Homework 1

Due Aug 30, 2023

1. Let  $g_i$  be a set of positive numbers, and consider the least-square fitting,

$$\min \sum_{i=1}^N \frac{1}{2} g_i |y_i - (w_0 + w_1 x_i)|^2.$$

Determine the normal equation for the parameters  $w_0$  and  $w_1$ .

2. Using Table 1.2, employ the data points up to 1988 for a linear regression analysis. Using the derived parameters, project the winning times for subsequent years. Compare these predictions against the actual recorded times.

3. Using the data points (-3,3), (-1,2), (0,1), (1,-1), and (3,-4), determine the optimal fits for linear, quadratic, and cubic polynomials. Once identified, graphically represent these polynomials alongside the original data points.

4. Fit the data in Table 1.2 to an exponential function  $h(x) = w_0 e^{w_1 x}$  by converting the problem to a linear regression problem.

5. Determine the conditional density associated with the Maximum Likelihood Estimation (MLE) approach for the weighted linear regression presented in Problem 1.