Math336 HW2 (Spring 2020)

Professor Youngjoon Hong — Due Date: Feb. 27 (3:30 pm)

Problem 1 *A necessary condition of fitting a straight line with the least-squares yields the equations*

$$\begin{aligned} a\sum_{i=1}^{m} x_i^2 + b\sum_{i=1}^{m} x_i &= \sum_{i=1}^{m} x_i y_i, \\ a\sum_{i=1}^{m} x_i + mb &= \sum_{i=1}^{m} y_i. \end{aligned} \tag{1}$$

Derive slope a and b (show all of your work for full credit).

Problem 2 *Make an appropriate transformation to fit the model* $P = ae^{bt}$ *using Eq.* (1) *above. Estimate* a *and* b*.*

t	7	14	21	28	35	42
P	8	41	133	250	280	297

Problem 3 *In the following data, W represent the weight of a fish and l represents its length. Fit the model $W = kl^3$ to the data using the least-squares criterion.*

Length (l)	*14.5*	*12.5*	*17.25*	*14.5*	*12.625*	*17.75*	*14.125*	*12.625*
Weight (w)	*27*	*17*	*41*	*26*	*17*	*49*	*23*	*16*

Problem 4 *Solving the following problem using graphical analysis: Maximize* $10x + 35y$ *subject to:*

$$
\begin{aligned}
&8x + 6y \leq 48, \quad \textit{(board fit lumber)},\\
&4x + y \leq 20, \quad \textit{(hr of carpentry)},\\
&y \geq 5, \quad \textit{(demand)},\\
&x, y \geq 0 \quad \textit{(non negativity)}.
\end{aligned}
$$