Homework #8

1. Best fitting line is $a_0 + a_1 x$, where $a_0 = 0.98890625$ and $a_1 = 0.9890625$.

2. Best quadratic is $a_0 + a_1 x + a_2 x^2$, where $a_0 = 1.005714285714286$ and $a_1 = -0.01$ and $a_2 = 1.008571428571428$.

3. 

$$
\begin{align*}
\frac{\sum_{i=1}^{n} w_i}{\sum_{i=1}^{n} w_i(1 + x_i)} &= \frac{\sum_{i=1}^{n} w_i(1 + x_i)}{\sum_{i=1}^{n} w_i(1 + x_i)^2} \\
\frac{\sum_{i=1}^{n} w_i(1 + x_i + x_i^2)}{\sum_{i=1}^{n} w_i(1 + x_i)(1 + x_i + x_i^2)} &= \frac{\sum_{i=1}^{n} w_i(1 + x_i)(1 + x_i + x_i^2)}{\sum_{i=1}^{n} w_i(1 + x_i + x_i^2)^2}
\end{align*}
$$

$a_0 = \sum_{i=1}^{n} w_i$, $a_1 = \sum_{i=1}^{n} w_i(1 + x_i)$, $a_2 = \sum_{i=1}^{n} w_i(1 + x_i + x_i^2)$.

4. (a) 

$$
\int_a^b w(x) \, dx \quad \int_a^b w(x) x \, dx \quad \int_a^b w(x) f(x) \, dx \quad \int_a^b w(x) x f(x) \, dx
$$

(b) Best fitting line is $a_0 + a_1 x$, where $a_0 = -1/6$ and $a_1 = 1$.

(c) Best fitting line $a_0 + a_1 x$, where $a_0 = -1/5$ and $a_1 = 1$.

5. $P_0(x) = 1$ and $P_1(x) = x$ and $P_2(x) = x^2 - 1/3$ and $P_3(x) = x^3 - 3x/5$ and $P_4(x) = x^4 - 6x^2/7 + 3/35$.

6. (a) Best fitting line $a_0 + a_1 x$, where $a_0 = 1$ and $a_1 = 3/5$.

(b) Best fitting quadratic is $a_0 + a_1 x + a_2 x(x^2 - 1/3)$, where $a_0 = 1$ and $a_1 = 3/5$ and $a_2 = 0$. 