$$\begin{cases} q(w, x) = a(wx)^2 + b w x \\ y = a(w_0 x)^2 + b w_0 x + \varepsilon \\ \hat{y} = q(w, x) \end{cases}$$

$$\mathcal{L}_i(w) = \frac{1}{2b} \sum_i \left[\varepsilon_i - \left(q(w, x_i) - q(w_0, x_i) \right) \right]^2$$

$$\partial_w \mathcal{L}_i(w) = -\frac{1}{b} \sum_i \varepsilon_i \, q'(w, x_i) + \underbrace{\frac{1}{b} \sum_i \left(q(w, x_i) - q(w_0, x_i) \right) q'(w, x_i)}_{= \lim_{b \to \infty} \partial_w \mathcal{L}(w)}$$

Show that at w^* st $q(w^*, x) = q(w_0, x) \; \forall x$

$$P(X) = aX^2 + bX + c = \text{cst}(X - X_0)^2$$

$$q(w, x) = (wx - w_0 x)^2 = (w - w_0)^2 x^2$$