Linearization of Functions of Two or More Variables

$$f\left(x_1, x_2, x_3 \ldots x_n\right) = f\left(\overline{x}_1, \overline{x}_2, \overline{x}_3 \ldots \overline{x}_n\right) +$$

$$\left(\left.\frac{\partial f\left(x_1, x_2, x_3 \ldots x_n\right)}{\partial x_1}\right|_{x_1=\overline{x}_1}\right)\left(x_1 - \overline{x}_1\right) +$$

$$\left(\left.\frac{\partial f\left(x_1, x_2, x_3 \ldots x_n\right)}{\partial x_2}\right|_{x_2=\overline{x}_2}\right)\left(x_2 - \overline{x}_2\right) + \ldots$$

$$\left(\left.\frac{\partial f\left(x_1, x_2, x_3 \ldots x_n\right)}{\partial x_n}\right|_{x_n=\overline{x}_n}\right)\left(x_n - \overline{x}_n\right)$$