

Product Rules for Differentiation

$$1) \quad \frac{d}{dx} [g_1(x) g_2(x)] = g_1(x) g_2'(x) + g_1'(x) g_2(x)$$

$$2) \quad \frac{d}{dx} [g_1(x) g_2(x) g_3(x)] \\ = g_1(x) g_2(x) g_3'(x) \\ + g_1(x) g_2'(x) g_3(x) \\ + g_1'(x) g_2(x) g_3(x).$$

$$3) \quad \frac{d}{dx} \left[\prod_{i=1}^n g_i(x) \right] \\ = \sum_{i=1}^n g_i'(x) \prod_{\substack{j=1 \\ j \neq i}}^n g_j(x).$$