

Section 29.3: cont'd

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one last example:

$$\text{let } z = y^4 \sin 6x$$

find all four second partial derivatives

$$\begin{array}{l} \text{1st} \\ \text{derivs} \end{array} \left. \begin{array}{l} \frac{\partial z}{\partial x} = 6y^4 \cos 6x \\ \frac{\partial z}{\partial y} = 4y^3 \sin 6x \end{array} \right.$$

$$\begin{array}{l} \text{2nd} \\ \text{deriv} \end{array} \left. \begin{array}{l} \frac{\partial^2 z}{\partial x^2} = \frac{\partial}{\partial x} (6y^4 \cos 6x) \\ \quad = -36y^4 \sin 6x \\ \frac{\partial^2 z}{\partial y^2} = \frac{\partial}{\partial y} (4y^3 \sin 6x) \\ \quad = 12y^2 \sin 6x \end{array} \right.$$

$$\begin{array}{l} \frac{\partial^2 z}{\partial y \partial x} = \frac{\partial}{\partial y} (6y^4 \cos 6x) \\ \quad = 24y^3 \cos 6x \\ \frac{\partial^2 z}{\partial x \partial y} = \frac{\partial}{\partial x} (4y^3 \sin 6x) \\ \quad = 24y^3 \cos 6x \end{array}$$

↔ same!