TA: Ondřej Čertík
web: http://hpfem.math.unr.edu/~ondrej/
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Quiz 17

Problem

$$z^3 = \sin x + y^4$$

Find $\frac{\mathrm{d}z}{\mathrm{d}t}$ if $\frac{\mathrm{d}x}{\mathrm{d}t} = 1$, $\frac{\mathrm{d}y}{\mathrm{d}t} = \frac{1}{4}$, $x = 0$, $y = 1$.

Solution

$$3z^2 z' = (\cos x)x' + 4y^3 y'$$

$$z' = \frac{1}{3z^2}((\cos x)x' + 4y^3) = \frac{1 \cdot 1 + 4 \cdot 1^3 \cdot \frac{1}{4}}{3z^2} = \frac{2}{3z^2} = \frac{2}{3}$$

Because $z^3 = \sin 0 + 1^4 = 1$, so the only solution is $z = 1$.