

(1) Find a tangent plane of the graph of $f(x, y) = xy^3 + x^2$ at $(2, -2)$.

(2) Use the linear approximation to estimate

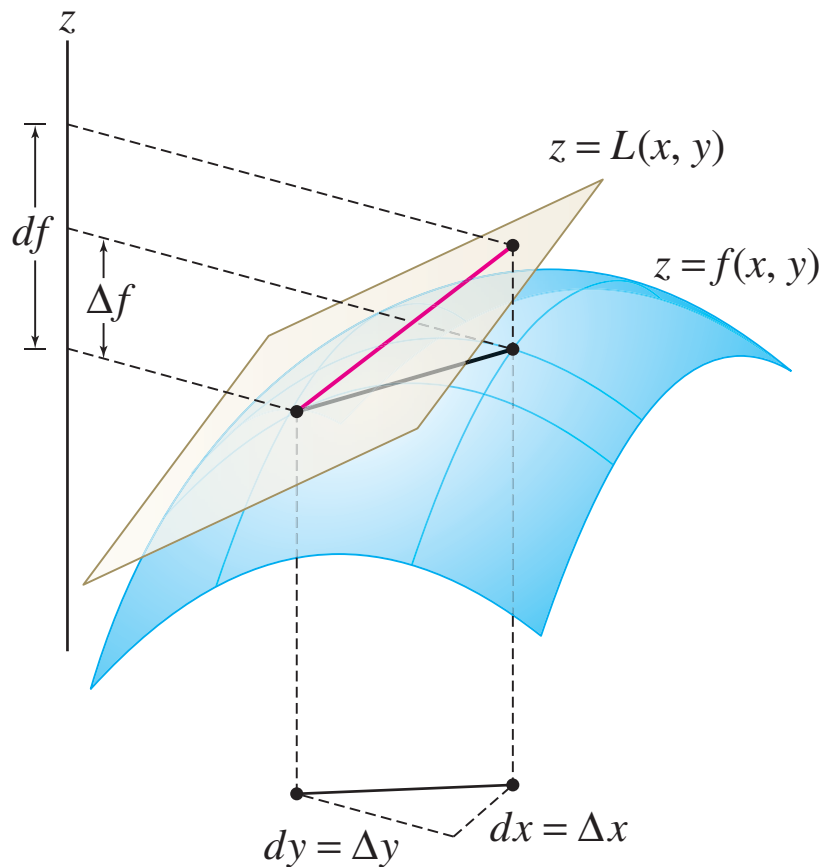
$$(3.99)^3(1.01)^4(1.98)^{-1}$$

We can write the linear approximation in terms of the change in f :

$$\Delta f \approx f_x(a, b)\Delta x + f_y(a, b)\Delta y$$

The linear approximation is often expressed in terms of **differentials**:

$$df = f_x(x, y)dx + f_y(x, y)dy = \frac{\delta f}{\delta x} dx + \frac{\delta f}{\delta y} dy$$



The quantity df is the change in height of the tangent plane, whereas Δf is the change in the function itself. The linear approximation tells us that the two changes are approximately equal:

$$\Delta f \approx df$$

- (3) A person's BMI is $I = W/H^2$, where W is the body weight (in kilograms) and H is the body height (in meters). Estimate the change in a child's BMI if (W, H) changes from $(40, 1.45)$ to $(41.5, 1.47)$.