

**Exercise 104**

Evaluate  $dy$  if  $y = x^3 - 2x^2 + 1$ ,  $x = 2$ , and  $dx = 0.2$ .

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**Solution**

Take the derivative of  $y$ .

$$\begin{aligned}\frac{dy}{dx} &= \frac{d}{dx}(x^3 - 2x^2 + 1) \\ &= \frac{d}{dx}(x^3) - \frac{d}{dx}(2x^2) + \frac{d}{dx}(1) \\ &= (3x^2) - 2(2x) + (0) \\ &= 3x^2 - 4x\end{aligned}$$

As a result, the differential of  $y$  is

$$dy = (3x^2 - 4x) dx.$$

If  $x = 2$  and  $dx = 0.2$ , then

$$dy = [3(2)^2 - 4(2)](0.2) = 0.8.$$