

If y is a function of u and u is a function of x , then y is also a function of x .

The Chain Rule:

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

$$y = \sqrt{3x + 1}$$

Find $\frac{dy}{dx}$ at $x = 0$

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Let $u = 3x + 1$ so $y = u^{1/2}$

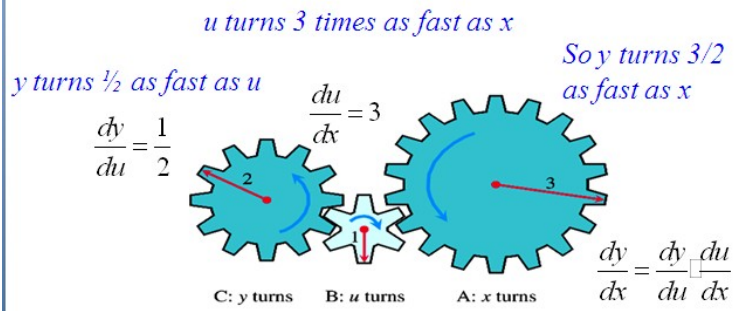
$$\frac{du}{dx} = 3 \qquad \frac{dy}{du} = \frac{1}{2}u^{-1/2} = \frac{1}{2} \quad \text{at } x = 0$$

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx} = \frac{1}{2} \cdot 3 = \frac{3}{2}$$

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3.6 Chain rule

When gear A makes x turns, gear B makes u turns and gear C makes y turns.



Rates are multiplied