Section : Chain Rule

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Chain Rule

Suppose the total manufacturing cost at a certain factory is a function of the number of units produced, which in turn is a function of the number of hours the factory has been operating. If C, q , and t denote the cost, units produced, and time, respectively, then

The Chain Rule

Suppose y is a differentiable function of u, and u is a differentiable function of x. Then y is a composite function of x and

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

The general Power Rule: For any real number n and differentiable function u

$$\left(u^n\right)' = nu^{n-1}u'$$

Chain Rule

Example 1 Find $\frac{dy}{dx}$ if $y = u^2 - 4u + 1$ and $u = x^2 - 1$.

Example 2 Find $\frac{dy}{dx}$ if $y = \sqrt{x^2 + 4x}$

Example 3:

The cost of procducing x units of a particular commodity is

$$C(x) = \frac{1}{2}x^2 + 4x + 40$$

dollars, and the production level t hours into a particular production run is $x(t) = 0.2t^2 + 0.5t$ units. At what rate is cost changing with respect to time after 2 hours?

Example 4:

When a certain commodity is sold for p dollars per unit, consumers will buy

$$D(p) = \frac{40,000}{p}$$

units per month. It is estimated that t months from now, the price of commodity will be $p(t) = 0.4t^{3/2} + 6.8$ dollars per unit. At what rate will the monthly demand for commodity be changing with respect to time 4 months from now?

Thank you for your attenion!