

The Derivative of a Constant

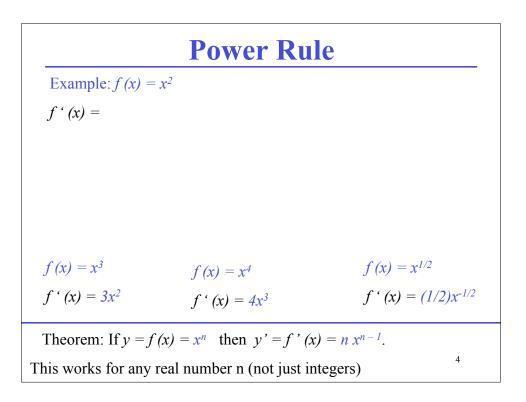
Let f(x) = 5.

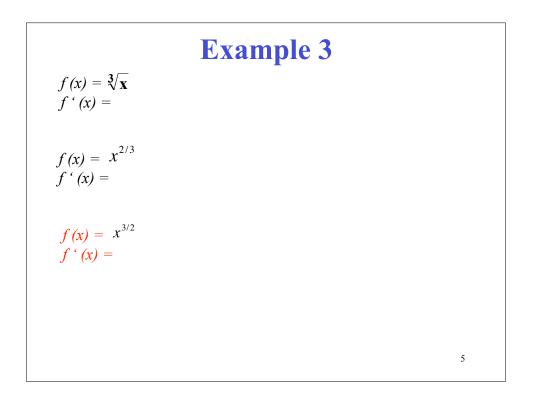
What is the slope of a the graph of the constant function?

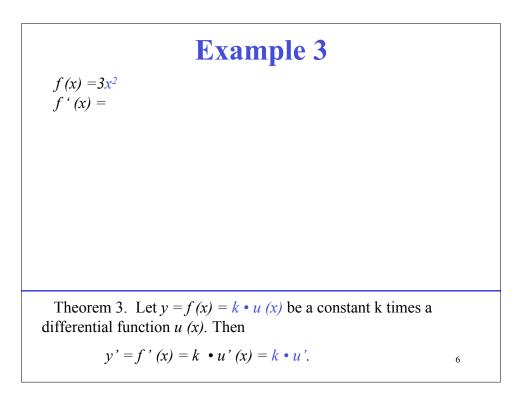
Theorem 1. Let y = f(x) = c be a constant function, then

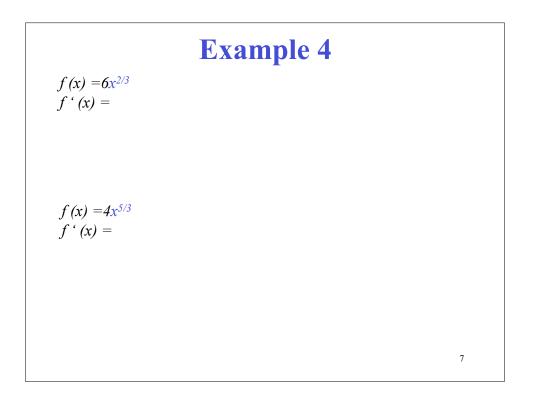
 $y'=f'(x)=\mathbf{0}.$

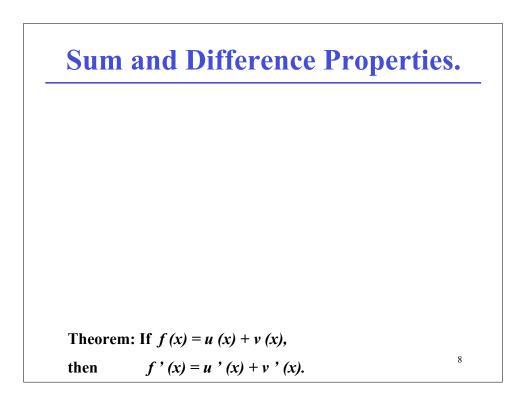
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Example 5

 $f(x) = 3x^5 + x^4 - 2x^3 + 5x^2 - 7x + 4$ f'(x) =

Applications. Remember that the derivative gives the instantaneous rate of change of the function with respect to x. That might be: Instantaneous velocity Instantaneous velocity Tangent line slope at a point on the curve of the function. Marginal Cost. If *C* (*x*) is the cost function *C* ' (*x*) approximates the cost of producing one more item at a production level of x items. *C* ' (*x*) is called the marginal cost.

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Application Example

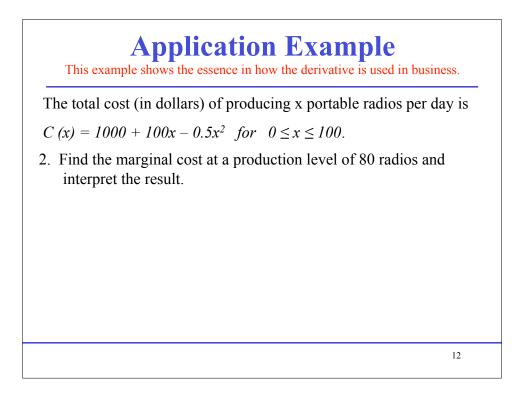
This example shows the essence in how the derivative is used in business.

The total cost (in dollars) of producing x portable radios per day is

 $C(x) = 1000 + 100x - 0.5x^2$ for $0 \le x \le 100$.

1. Find the marginal cost at a production level of *x* radios.

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Application Example, continued

The total cost (in dollars) of producing x portable radios per day is

 $C(x) = 1000 + 100x - 0.5x^2$ for $0 \le x \le 100$.

C'(x) = 100 - x, C'(80) = \$20

3. Find the actual cost of producing the 81st radio and compare this cost with the previous results.

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Summary. If f(x) = C then f'(x) = 0. If $f(x) = x^n$ then $f'(x) = n x^{n-1}$. If $f(x) = k \cdot u(x)$ then $f'(x) = k \cdot u'(x) = k \cdot u'$. If $f(x) = u(x) \pm v(x)$, then $f'(x) = u'(x) \pm v'(x)$.