

WARM UP EXERCISE

The total sales of a company (in millions of dollars) t months from now are given by

$$S(t) = 0.015t^4 + 0.4t^3 + 3.4t^2 + 10t - 3$$

Find $S'(t)$. Find $S(4)$ and $S'(4)$. Write a brief verbal interpretation of these results.

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§11.3 Derivates of Products and Quotients

The student will learn about:

- the derivative of a product of two functions
- the derivative of a quotient of two functions.

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Derivates of Products

Theorem 1 - Product Rule

If $f(x) = F(x) \cdot S(x)$,

Then $f'(x) = F(x) \cdot S'(x) + S(x) \cdot F'(x)$,

$$f'(x) = F \frac{dS}{dx} + S \frac{dF}{dx}$$

Find the derivative of $y = 5x^2(x^3 + 2)$.

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Example

Find the derivative of $y = 5x^{1/2}(3x^2 - 5x)$.

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Derivatives of Quotients

Theorem 2. Quotient Rule:

If $f(x) = T(x) / B(x)$, then

$$f'(x) = \frac{B(x) \cdot T'(x) - T(x) \cdot B'(x)}{[B(x)]^2}$$

Find the derivative of $f(x) = \frac{3x}{2x + 5}$.

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Example

Find the derivative of $S(t) = \frac{90t^2}{t^2 + 50}$

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Application

Total sales S in thousands of CD's for a CD company are given by

$$S(t) = (90t^2)/(t^2+50)$$

where t is the number of months since the release of the CD.

We saw that $S'(t) = (9000t^2)/(t^2+50)^2$.

1. Find $S(10)$ and $S'(10)$.
2. Estimate total sales after 11 months.

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More Examples

$$f(x) = \frac{2x - 4}{5x + 3}$$

$$g(x) = \frac{6\sqrt[3]{x}}{x^2 - 3}$$

$$h(x) = \frac{5x^3 - 2x}{(x^2 - 3)\sqrt[3]{x}}$$

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