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.

§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.**

Derivates of Products

Theorem 1 - Product Rule

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

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

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

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

Example

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

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 $f(x) = \dfrac{3x}{2x+5}$.

Example

Find the derivative of $f(x) = \dfrac{90t^2}{t^2 + 50}$

Application

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

$$S(t) = \frac{90t^2}{t^2 + 50}$$

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

1. **Find S'(t).**
2. **Find S(10) and S'(10). What are these?**
3. **Estimate total sales after 11 months**

More Examples

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

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

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