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## 11 – Product & Quotient Rules

## Theorem: Product Rule

Let f and g be differentiable.

$$\frac{d}{dx} \left[ f(x)g(x) \right] = f(x)\frac{d}{dx} \left[ g(x) \right] + g(x)\frac{d}{dx} \left[ f(x) \right]$$
$$\left[ f(x)g(x) \right]' = f(x)g'(x) + g(x)f'(x)$$

1. Find the derivative of  $f(x) = (\sqrt[3]{x} + 7x^5)(1 + e^x)$ .

2. Suppose that h(x) is function for which h'(x) = x<sup>2</sup>h(x) and h(2) = 10.
(a) Find h'(2).

(b) Find h''(2).

## Theorem: Quotient Rule

Let f and g be differentiable.

$$\frac{d}{dx} \left[ \frac{f(x)}{g(x)} \right] = \frac{g(x)\frac{d}{dx} \left[ f(x) \right] - f(x)\frac{d}{dx} \left[ g(x) \right]}{\left( g(x) \right)^2}$$
$$\left[ \frac{f(x)}{g(x)} \right]' = \frac{g(x)f'(x) - f(x)g'(x)}{\left( g(x) \right)^2}$$

**3.** Find the derivative of  $f(x) = \frac{\sqrt{x} + xe^x}{e^x - x}$ 



