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13 - Chain Rule

Theorem: Chain Rule—Composition Rule

Let f and g be differentiable.

[f(g(x))]' = f'(g(x))g'(x)

1. Find the derivative of $f(x) = e^x \tan(3x)$.

2. Use the chain rule and NO quotient rule to find the derivative of $g(x) = \frac{2}{x^5 + \sin x}$.

Theorem: Derivative of a^x

If a > 0, then $\frac{d}{dx}(a^x) = a^x \ln(a)$.

3. Evaluate the following derivatives.

(a)
$$\frac{d}{dx} \left[\cos(3x) \right]$$

(b)
$$\frac{d}{dx} \left[e^{-4x} \right]$$

(c)
$$\frac{d}{dx} \left[\sqrt[3]{\sqrt{x} \sec(x)} \right]$$

(d)
$$\frac{d}{dx} \left[e^{7x} \sin(\pi^x - \cos x) \right]$$

(e)
$$\frac{d}{dx} \left[\cos^5 \left(\frac{3x}{1 + \tan x} \right) \right]$$