

Lesson 552

Derivatives and Integrals on logarithms and exponentials

Derivative Rule

Function Name	f(x)	f'(x)
Logarithm	$f(x) = \log_a g(x)$	$f'(x) = \frac{g'(x)}{g(x) \cdot \ln a}$
Exponential	$f(x) = a^{g(x)}$	$f'(x) = g'(x) \cdot a^{g(x)} \cdot \ln(a)$

Examples

1) $y = 4^{4x^4}$

2) $y = 4^{-5x^3}$

3) $y = \log_3 3x^2$

4) $y = \log_2 4x^2$

3) $\int 80x^3 \cdot 3^{5x^4-2} dx; u = 5x^4 - 2$

7) $\int 2 \cdot 3^x dx$

8) $\int 3 \cdot 5^x dx$

Assignment 552

$$5) y = \log_3 (3x^5 + 5)^5$$

$$6) y = \log_5 (-5x^3 - 2)^3$$

$$7) y = (4^{x^3} + 2)^3$$

$$8) y = 3^{(x^4 + 1)^3}$$

$$9) y = 3^{\cos 3x^4}$$

$$10) y = \log_5 \tan 4x^4$$

77. Inflation If the annual rate of inflation averages 5% over the next 10 years, the approximate cost C of goods or services during any year in that decade is

$$C(t) = P(1.05)^t$$

where t is the time in years and P is the present cost.

- If the price of an oil change for your car is presently \$24.95, estimate the price 10 years from now.
- Find the rate of change of C with respect to t when $t = 1$ and $t = 8$.
- Verify that the rate of change of C is proportional to C . What is the constant of proportionality?