

Other Exponential and Logarithmic Functions - Differentiation and Integration

Differentiation

$$\frac{d}{dx}(a^x) = a^x \ln a$$

$$\frac{d}{dx}(a^u) = a^u \ln a \cdot \frac{du}{dx}$$

$$\frac{d}{dx}(\log_a x) = \frac{1}{x \ln a}$$

$$\frac{d}{dx}(\log_a u) = \frac{1}{u \ln a} \cdot \frac{du}{dx}$$

Integration

$$\int a^x dx = \frac{a^x}{\ln a} + C$$

Directions: For questions 1 through 11, find the derivative.

1. $y = e^x$

2. $y = e^e$

3. $y = x^e$

4. $y = x^x$

5. $y = 6^x$

6. $y = x^2 \cdot 2^x$

7. $y = 6^{-\frac{x}{2}} \cdot \sin(3x+1)$

8. $y = \log \frac{x\sqrt{1-2x}}{\sqrt{3x}}$

9. $y = (1+x)^{\frac{1}{x}}$

10. $y = \ln x^{\cos x}$

11. $y = (\ln x)^{\cos x}$

Directions: For questions 12 through 15, evaluate the definite integral.

$$12. \int_{-3}^2 6^x - 2^x dx$$

$$13. \int_{\frac{\pi}{3}}^{\frac{\pi}{2}} 2^{\cos x} \sin x dx$$

$$14. \int_1^{10} \frac{\log_{10} x}{x} dx$$

$$15. \int_e^{10} \frac{1}{x \log_{10} x} dx$$

Directions: For questions 16 and 17, find the limit.

16. $\lim_{x \rightarrow 0^+} x^x$

17. $\lim_{x \rightarrow \infty} \ln x^{\frac{1}{x}}$