Special Case Integration

Numberbender | WORKSHEET

Name: _____ Date: _____ Score: _____

Find the antiderivative of each. Show all work.

AB Calculus
Worksheet #30

Find the antiderivative of each of the following, given: $\int a^x dx = \frac{1}{\ln a} a^x + C$

Examples:

1. $\int 8^x dx = \square 8^x + C = \boxed{\frac{1}{\ln 8} \bullet 8^x + C}$

   $\frac{d}{dx}\left(8^x\right) = \ln 8 \bullet 8^x \Rightarrow ck : 8^x = \square \ln 8 \bullet 8^x \Rightarrow \square = \frac{1}{\ln 8}$

2. $\int_0^3 3^{2x} dx = \boxed{\frac{1}{2\ln 3}} \bullet 3^{2x}\Big]_0^3 = \frac{1}{2\ln 3}\left(3^{2(3)} - 3^{2(0)}\right) = \frac{1}{2\ln 3}\left(3^6 - 1\right) = \boxed{\frac{728}{2\ln 3}}$

   $\frac{d}{dx}\left(3^{2x}\right) = 2\ln 3 \bullet 3^{2x} \Rightarrow ck : 3^{2x} = \square \bullet 2\ln 3 \bullet 3^{2x} \Rightarrow \square = \frac{1}{2\ln 3}$

Problems:

1. $\int 1.3^x dx$	2. $\int_{-2}^{0} 5^{-\theta} d\theta$	3. $\int_1^{\sqrt{2}} 2^{x^2} x dx$
4. $\int_0^{\frac{\pi}{2}} 7^{\cos t} \sin t dt$	5. $\int 2^x dx$	6. $\int 5^x dx$
7. $\int_0^1 2^{-\theta} d\theta$	8. $\int e^{3x} dx$	9. $\int_1^2 \frac{2^{\ln x}}{x} dx$
10. $\int_{-2}^{2} 5 dx$	11. $\int_0^{\frac{\pi}{4}} \cos x dx$	12. $\int_0^1 (8s^3 - 12s^2 + 5) ds$
13. $\int_1^{27} y^{-4/3} dy$	14. $\int_0^{\pi/3} \sec^2 x dx$	15. $\int_0^1 \frac{36}{(2x+1)^3} dx$

Special Case Integration

Numberbender | ANSWER KEY

Answer key — for instructor use only.

Answers:

1. $\frac{1}{\ln 1.3} \bullet 1.3^x + C$	2. $\frac{24}{\ln 5}$	3. $\frac{1}{\ln 2}$	4. $\frac{6}{\ln 7}$	5. $\frac{1}{\ln 2} \bullet 2^x + C$	6. $\frac{1}{\ln 5} \bullet 5^x + C$
7. $\frac{1}{2\ln 2}$	8. $\frac{1}{3}e^{3x} + C$	9. $\frac{2^{\ln 2} - 1}{\ln 2}$	10. 20	11. $\frac{\sqrt{2}}{2}$	12. 3
13. 2	14. $\sqrt{3}$	15. 8			