Chapter 5 Review
No Calculator

1. Define $\ln x$ and illustrate the definition.

In questions 2–5, complete the statement.

2. $\ln e =$

3. $\ln 1 =$

4. $e^{\ln x} =$

5. $\log_a a^x =$

6. Write $\frac{1}{3}\ln x + 5\ln y - 2\ln z$ as a single logarithm.

7. Expand $\ln\left(\frac{3x^2}{\sqrt{x-2}}\right)$.

In questions 8–10, solve for *x*.

8. $\log_2 \frac{1}{16} = x$

9. $7e^{2x} = 42$

10. $\ln x^5 = 50$

In questions 11–19, find the derivative of each function.

11. $y = (\ln x)^5$

12. $y = \ln\sqrt{x^3 + 7}$

13. $f(x) = e^{6x^5}$

14. $y = \ln e^{x^3}$

15. $y = 10^x$

16. $y = \log_2(16x^4)$

17. $f(x) = 4^x \cdot x^4$

18. $y = \log_2 \dfrac{2x}{x+5}$

19. $y = x^{5x}$

20. Find $\frac{dy}{dx}$ for $y = x \cdot e^y + 6x$.

In questions 21–30, find each integral.

21. $\int \frac{1}{4x}\,dx$

22. $\int \frac{x^3}{3 - x^4}\,dx$

23. $\int \cot 7x\,dx$

24. $\int_1^e \frac{(\ln x)^4}{x}\,dx$

25. $\int_3^4 e^{6-x}\,dx$

26. $\int x \cdot e^{3x^2}\,dx$

27. $\int \frac{e^x}{5+e^x}\,dx$

28. $\int 7^{-x}\,dx$

29. $\int_1^{\sqrt[3]{2}} x^3 \cdot 5^{x^4}\,dx$

30. $\int_0^{\pi/2} \cos x \cdot e^{\sin x}\,dx$

31. Prove that $\int \tan x\,dx = \ln|\sec x| + C$.

32. Solve the differential equation $\frac{dy}{dt} = ky$ for y. Show your steps.

33. During lunch, you eat a french fry from a sick friend's plate and ingest 40 bacteria. Six hours later, the bacteria population has grown exponentially to 200. Find the value of k and write the appropriate equation to find how many bacteria will be present in 48 hours (do not solve).