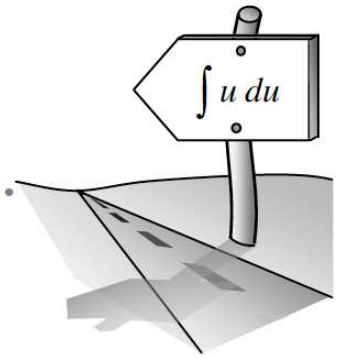
7.2.4 What else can $u\,du$?



Varied Integration Techniques

7-92. Practice your integration skills on these antiderivatives. Use u-substitution when convenient.

a. $\int \frac{-10}{(3x-5)^{-3}}\,dx$

b. $\int \frac{\sin x}{\cos x}\,dx$

c. $\int \frac{x^2 \sin(5x^3)}{\cos^6(5x^3)}\,dx$

d. $\int \frac{-10}{3x-5}\,dx$

e. $\int \tan x\,dx$

f. $\int \frac{\cos(5x^3-9x^5)}{\sin^2(5x^3-9x^5)}(x^2-3x^4)\,dx$

7-93. Use u-substitution to rewrite the following definite integrals entirely in terms of u. Be sure to change your bounds when necessary. Verify your work by evaluating both forms of the integral on your calculator.

a. $\int_0^{-1} 3x^2\sqrt{x^3+1}\,dx$

b. $\int_2^{-1} x(x^2+2)^3\,dx$

c. $\int_0^{\pi/4} \sin^2 2x \cos 2x\,dx$

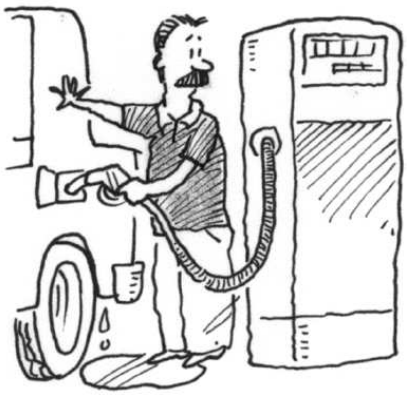
7-94. U-substitution can be used to "undo" the Chain Rule, but it can be used in other situations as well. Develop a method to integrate the following problems. Hint: Let u equal the denominator.

a. $\int \frac{x+5}{x-3}\,dx$

b. $\int_{-1}^{2} \frac{x+5}{x-3}\,dx$

c. Demonstrate another method (not u-substitution) that you could use to integrate the problems above.

7-95. Find the antiderivative of $\frac{dy}{dt} = \cot\ x$.



7-96. Gary pumps gas into his gas tank at a constant rate of 6 ounces per second. He does not realize it, but a hole in his tank allows gas to leak at a rate of $\sqrt{t+1}$ ounces per second.

a. How many ounces of gas leaked during the first 8 seconds?

b. If the tank started out with 2 gallons (256 ounces) of gas, how much gas is in the tank after 3 seconds? After 8 seconds? Write an equation that will tell you the amount of gas in the tank at t seconds.

c. It takes Gary a whole minute to realize what is going on. When does he have the most gas in the tank? Justify your answer.

Review & Preview

7-97. Find $\frac{dy}{dt}$ for each of the following functions. Homework Help

a. $y = \frac{(3x^2-2)^3}{-2}$

b. $y = 6^{(3x^2-2)^3}$

c. $(2y)^2 - \cos(x^5) = 9$

7-98. Integrate. Homework Help

a. $\int_{-1}^{1} 4^{x+2}\,dx$

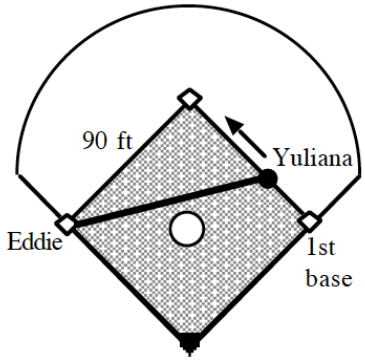
b. $\int 6t \cdot 7^{3t^2}\,dt$

c. $\int \sin^2(3m-1)\cdot\cos(3m-1)\,dm$

7-99. Find a possible equation for y given $\frac{dy}{dx} = 12e^{4x} - \frac{1}{x}$. Homework Help

7-100. Eddie is standing on third base, watching in amazement as Yuliana tries to steal second. If Yuliana runs at 15 $\frac{\text{ft}}{\text{sec}}$, how fast is her distance from Eddie changing when she is 40 feet from first base?

Homework Help



7-101. Brooke and Anne came across this integral: $y = \int dx$. Brooke says it cannot be evaluated because there is nothing to integrate. Anne says the answer is $y = x + C$. Who is correct and why? Homework Help

7-102. Mr. Gauss is known for his indecision! He will often walk down the hallway toward his office, change his mind and turn around, and then turn around again! One time he left class when the bell rang ($t = 0$) traveling in a path with velocity $v = 3t^2 - 17t + 10$ in feet where t is the number of seconds after the bell rang. After 7 seconds, he arrived at his office. Homework Help

a. Find the total distance he traveled during the 7 seconds.

b. Assuming he traveled back and forth in a straight line, how far was his classroom from his office?

7-103. Find values for a, b, c, and d so that $f(x)$ below is continuous and differentiable for all values of x.

Homework Help

$$f(x) = \begin{cases} 2^x & \text{for} \quad x < 0 \\ ax^2 + bx + c & \text{for} \quad 0 \le x \le 4 \\ d & \text{for} \quad x > 4 \end{cases}$$