

## Assignment 6-3

Evaluate (Integrate) in Problems 1-8.

1.  $\int_0^1 2x \, dx$
2.  $\int_2^7 3 \, dv$
3.  $\int_{-1}^1 (t^2 - 2) \, dt$
4.  $\int_{-1}^0 (x - 2) \, dx$
5.  $\int_2^5 (-3v + 4) \, dv$
6.  $\int_0^3 3x^2 + x - 2 \, dx$
7.  $\int_1^2 \left(\frac{3}{x^2} - 1\right) \, dx$
8.  $\int_1^4 \frac{u-2}{\sqrt{u}} \, du$
9.  $\int_1^8 \sqrt{\frac{2}{x}} \, dx$
10.  $\int_{-1}^0 \left(t^{\frac{1}{3}} - t^{\frac{2}{3}}\right) \, dt$
11.  $\int_0^\pi (1 + \sin(x)) \, dx$
12.  $\int_1^e \left(2x + \frac{1}{x}\right) \, dx$

Use the Second Fundamental Theorem of Calculus to evaluate in Problems

13.  $\frac{d}{dx} \int_{-3}^x (t^2 - t + 1) \, dt$
14.  $\frac{d}{dx} \int_2^x \sqrt[3]{t^2 - 5t} \, dt$
15.  $\frac{d}{dt} \int_6^t \frac{2}{x-5} \, dx, t > 6$
16.  $\frac{d}{dt} \int_0^{2t} \sin(x) \, dx$
17.  $\frac{d}{dx} \int_x^3 (1-t)^4 \, dt$
18.  $\frac{d}{dx} \int_{x^2}^3 (1-t)^4 \, dt$
19.  $\frac{d}{dt} \int_{3t}^{4t} 2^x \, dx$
20.  $\int_1^a t(3t^2 - 1)^5 \, dt$

Differentiate in Problems 21-23

21.  $y = (3x^2 - 5)^8$
22.  $f(x) = x^2 \sqrt[4]{x^3 - 5}$
23.  $g(t) = \frac{t^2 - 1}{t^3 + 3}$
24. Use the limit definition of the derivative to find  $f'(x)$ , if  $f(x) = x^2 - x$ .
25. For  $f(x) = \begin{cases} 2x^2 - x + 1, & x \leq 1 \\ x^3 + 1, & x > 1 \end{cases}$  find:
  - a.  $f(1)$
  - b.  $\lim_{x \rightarrow 1^-} f(x)$
  - c.  $\lim_{x \rightarrow 1^+} f(x)$
  - d.  $f'(x)$
  - e.  $f'(1)$  if it exists
26. Is the function in Problem 25 continuous on  $(-\infty, \infty)$ ? Why or why not?
27. Is the function in Problem 25 differentiable on  $(-\infty, \infty)$ ? Why or why not?
28. Find equations for lines tangent to the graph of the function in Problem 25 when
  - a.  $x = 1$
  - b.  $x = 0$
  - c.  $x = 2$
29. Suppose  $\int_0^3 f(x) \, dx = 5$ ,  $\int_3^5 f(x) \, dx = -2$ , and  $\int_0^3 g(x) \, dx = -1$ . Find:
  - a.  $\int_0^3 (f(x) + g(x)) \, dx$
  - b.  $\int_0^3 3g(x) \, dx$
  - c.  $\int_0^3 (2g(x) - 5f(x)) \, dx$
  - d.  $\int_0^5 f(x) \, dx$
  - e.  $\int_5^0 2f(x) \, dx$
  - f.  $\int_3^3 g(x) \, dx$
30. For functions  $f$  and  $g$  in Problem 29, suppose  $f$  is even and  $g$  is odd. Find:
  - a.  $\int_{-3}^0 f(x) \, dx$
  - b.  $\int_{-3}^0 g(x) \, dx$
  - c.  $\int_{-3}^3 -f(x) \, dx$
  - d.  $\int_{-3}^3 |g(x)| \, dx$

if  $x = 0$  is the only zero of  $g(x)$
31. Evaluate  $\int_1^5 x^2 \sqrt{x-1} \, dx$  without a calculator.