Assignment 6-1

For Problems 1-4, rewrite the integrand and then integrate.

1. $\int \frac{1}{x^3}\,dx$ 2. $\int \sqrt[4]{t}\,dt$ 3. $\int (x+1)(x-2)\,dx$ 4. $\int \frac{2y}{\sqrt{y}}\,dy$

Evaluate (integrate) each integral in Problems 5-17.

5. $\int (2x^3 - x^2 + 1)\,dx$ 6. $\int \frac{1}{3x^2}\,dx$ 7. $\int \frac{1}{(3x)^2}\,dx$ 8. $\int \left(3 - \sqrt[5]{y^2}\right)dy$

9. $\int \left(5x^{\frac{1}{4}} - x^{\frac{-2}{3}}\right)dx$ 10. $\int (3t-10)^2\,dt$ 11. $\int (2\sin x + 3\cos x)\,dx$ 12. $\int (\sec^2\theta + \theta + 2)\,d\theta$

13. $\int \frac{8x^4 - 2x^2 + 1}{2x^2}\,dx$ 14. $\int \frac{2\sqrt{t} - 1}{\sqrt{t}}\,dt$ 15. $\int \sqrt{y}\left(y^2 + 2\sqrt{y}\right)dy$ 16. $\int (\csc^2\theta - 2\theta)\,d\theta$

17. $\int \sec x(\sec x + \tan x)\,dx$

18. If $f'(x) = 3x^2 - 4x + 2$ and $f(1) = -3$, find $f(x)$.

19. The derivative of a function is $\frac{dy}{dt} = \frac{-3}{t^2} + 1$. If the graph of the function contains the point (3, 10), find the equation of the function.

20. a. Find an equation for the family of functions whose derivative is $y' = 3\sqrt{x}$.
    b. Find the particular function from the family in Part a. whose curve passes through the point (4, 0).

21. Find $g(x)$, given that: $g''(x) = 2x - 3$, $g'(0) = -5$, and $g(-1) = 2$.

22. Find $f(x)$, given that: $f''(x) = \sin x$, $f'(0) = 2$, and $f(0) = 2$.

23. Evaluate $\frac{d}{dx}\int (2x-1)^3\,dx$. Hint: This is a derivative of an integral.

24. Find $f(x)$, given that: $f'(x) = \begin{cases} 2x+8, & x \le 2 \\ 3x^2, & x > 2 \end{cases}$, $f(1) = 1$.

25. The position of a particle moving on the x-axis is given by $x(t) = t^4 - 4t^3 + 2$.
    a. Find the velocity and acceleration equations for the particle.
    b. Find when the particle is moving left.
    c. Find the velocity when the acceleration is zero.

26. The acceleration of an object moving along a horizontal path is given by the equation $a(t) = 6t - 4$. The object's initial velocity is 5, and its initial position is -2.
    a. Find a velocity equation for the object.
    b. Find the velocity of the object when $t = 2$.
    c. Find a position equation for the object.
    d. Find the object's position when $t = 2$.