Chapter 4 Review

1. Evaluate the integral: $\int (3x^2 - 2x + 5)\, dx$.

2. Evaluate the integral: $\int \frac{x^3 - x^2}{x^2}\, dx$.

3. Find the function, $y = f(x)$, if $f'(x) = 2x - 1$ and $f(1) = 3$.

4. Use $a(t) = -32$ feet per second squared as the acceleration due to gravity. An object is thrown vertically downward from the top of a 480-foot building with an initial velocity of 64 ft/s. With what velocity does the object hit the ground?

5. Evaluate the integral: $\int \frac{ax^2 + bx^3}{\sqrt{x}}\, dx$.

6. Use a graphing utility to graph $f(x) = x^4 - 6x^3 + 11x^2 - 6x$. Then use the upper sums to approximate the area of the region in the first quadrant bounded by f and the x-axis using four subintervals. (Round your answer to three decimal places.)

7. Write the definite integral that represents the area of the region enclosed by $y = 4x - x^2$ and the x axis.

8. Sketch the region whose area is indicated by the integral: $\int_0^3 \sqrt{9 - x^2}\, dx$.

9. Determine if $f(x) = \frac{5}{2x - 3}$ is integrable on [0, 2]. Give a reason for your answer.

10. If $\int_2^5 f(x)\,dx = 5$ and $\int_4^5 f(x)\,dx = \pi$, find:

a. $\int_5^5 f(x)\,dx$

b. $\int_5^4 f(x)\,dx$

c. $\int_2^4 f(x)\,dx$

11. Evaluate: $\int_{\pi/4}^{\pi/3} \sec^2 x\,dx$.

12. Evaluate: $\int_0^3 |x - 2|\,dx$.

13. Find the average value of $f(x) = \sin x$ on the interval $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$.

14. Evaluate: $\frac{d}{dx}\int_3^x (2t^2 + 5)^2\,dt$.

15. Evaluate the integral: $\int_{\pi/4}^{3\pi/4} (-\csc^2 t)\,dt$.

16. Use a graphing utility to graph $f(x) = \cos x - \sin x$ on the interval $[0, \pi]$. Calculate the area in the first quadrant bounded by the x-axis and f.

17. Consider $F(x) = \int_2^x \frac{1}{1 + t^4}\,dt$. Find $F'(x)$ and $F'(2)$.

18. Consider $F(x) = \int_x^1 \sqrt{1 + t^2}\, dt$. Find $F'(x)$.

19. Consider $F(x) = \int_1^{x^2} \left(t^3 + \sqrt{t} \right) dt$. Find $F'(x)$.

20. Find the value of c guaranteed by the Mean Value Theorem for Integrals for $f(x) = \frac{4}{x^2}$ on the interval [1, 4].

21. Evaluate the integral: $\int_0^1 x\sqrt{1 - x^2}\, dx$.

22. Evaluate the integral: $\int_0^1 x\sqrt{x^2 + 1}\, dx$.

23. Find the indefinite integral: $\int \left(x - \frac{1}{x} \right)^2 dx$.

24. Find the indefinite integral: $\int \frac{x}{\sqrt{x - 1}}\, dx$.

25. Evaluate the integral: $\int \frac{\sec^2 x}{\sqrt{\tan x}}\, dx$.

26. Evaluate the integral: $\int \frac{\cos \sqrt{x}}{\sqrt{x}}\, dx$.

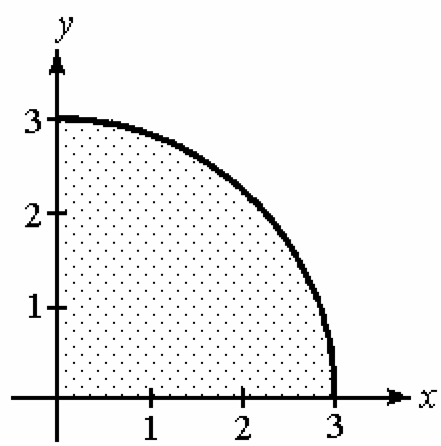
27. Consider the integral, $\int_{\sqrt{2}}^{5} x(4x^2 - 3)^{19}\,dx$. Determine new upper and lower limits of integration using the substitution $u = 4x^2 - 3$.

28. Evaluate the definite integral: $\int_{-8}^{0} \frac{1}{\sqrt{1 - x}}\,dx$.

29. Use the Trapezoidal Rule, with $n = 4$, to approximate the area of the region bounded by the graphs of $y = \sin x$ and $y = 0$ on the interval $[0, \pi]$.

30. Let $f(x) = (x - 1)^2$.
   a. Sketch a graph of $f(x)$.
   b. Divide the interval [1, 3] into four equal subintervals and label the markings on the x-axis.
   c. Evaluate f at each of the values found in part **b**.
   d. Use the Trapezoidal Rule to approximate $\int_{1}^{3} (x - 1)^2\,dx$.

1. $x^3 - x^2 + 5x + C$
2. $\frac{x^2}{2} - x + C$
3. $y = x^2 - x + 3$
4. −186.6 ft/s
5. $\frac{2a}{5}x^{5/2} + \frac{2b}{7}x^{7/2} + C$
6. 0.486
7. $\int_0^4 (4x - x^2)\, dx$
8. See graph below.



9. No, because $f(x)$ is not continuous at $x = \frac{3}{2}$.
10. **a.** 0
    b. $-\pi$
    c. $5 - \pi$
11. $\sqrt{3} - 1$
12. $\frac{5}{2}$
13. $\frac{2\sqrt{2}}{\pi}$
14. $(2x^2 + 5)^2$
15. −2
16. $\sqrt{2} - 1 \approx 0.414$
17. $F'(x) = \frac{1}{1 + x^4}$, $F'(2) = \frac{1}{17}$

18. $-\sqrt{1 + x^2}$

19. $\left[x^3 + \sqrt{x}\right](2x)$

20. 2

21. $\frac{1}{3}$

22. $\frac{1}{3}[2^{3/2} - 1]$

23. $\frac{x^3}{3} - 2x - \frac{1}{x} + C$

24. $\frac{2}{3}\sqrt{x - 1}(x + 2) + C$

25. $2\sqrt{\tan x} + C$

26. $2 \sin \sqrt{x} + C$

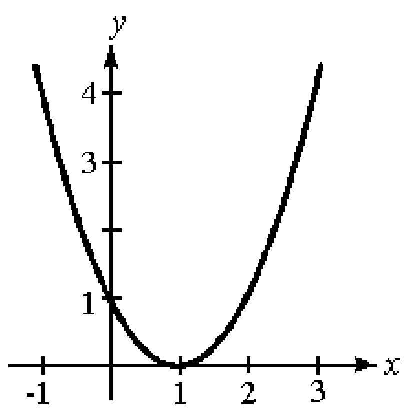
27. Upper, 97; lower, 5

28. 4

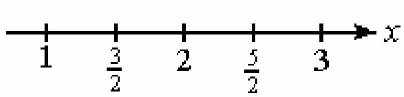
29. $\frac{\pi}{4}\left[1 + \sqrt{2}\right] \approx 1.896$

30. See graph below.

a.



b.



c. $f(1) = 0,\ f\left(\frac{3}{2}\right) = \frac{1}{4},\ f(2) = 1,\ f\left(\frac{5}{2}\right) = \frac{9}{4},\ f(3) = 4$

d. $\frac{11}{4}$