

5. The Integral

Problem Set 5.2

8. General solution: $y = (x^{3/2} + C)^{2/3}$

At $x = 1$, $y = 4$, $C = 7$

12. General solution: $u = \left(t^2 - \frac{t^4}{2} + C\right)^{-1/2}$

At $t = 0$, $u = 4$, $C = \frac{1}{16}$

14. General solution: $y = \frac{10}{(x^2 + 2)^5 + C}$

At $x = 0$, $y = 1$, $C = -22$

22. Hint: the ball achieves the maximum height when its velocity is zero.

28. 352 feet

34. 68.125 feet per second

Problem Set 5.3

6. $-\frac{1154}{105} \approx 10.99$

12. $\sum_{i=1}^{100} \frac{(-1)^{i+1}}{i}$

16. $\sum_{i=1}^n f(w_i) \Delta x$

20. -65

24. $-a_2 + a_{m+1}$

30. $\frac{4n^3 - 12n^2 + 11n}{3}$

Problem Set 5.4

6. $\frac{31}{8} = 3.875$

10. 4.656

12. Area of the circumscribed polygon (n rectangles): $A(S_n) = \frac{1}{12} \left[2 + \frac{3}{n} + \frac{1}{n^2} \right] + 1$

Area of the region: $\lim_{n \rightarrow \infty} A(S_n) = \frac{7}{6} \approx 1.17$

18. $\frac{7}{6} \approx 1.17$ feet

20. $\frac{98}{3} \approx 32.7$ meters

Problem Set 5.5

2. 0.75

6. 113.25

10. $\int_0^\pi \sin^2 x \, dx$

14. $\int_{-2}^1 (3x^2 + 2) \, dx$
 $= \lim_{n \rightarrow \infty} \left[42 - 54 \left(1 + \frac{1}{n} \right) + \frac{27}{2} \left(2 + \frac{3}{n} + \frac{1}{n^2} \right) \right]$
 $= 15$

20. $-\pi - 8$

24. (a) 0 (b) 6 (c) 6 (d) -6 (e) 0 (f) 0

Problem Set 5.6

4.

8. 3

12. $5\sqrt{3} + 4\sqrt{2} + 2\pi$

16. $\cos^3(2x)\tan(x)$

18. $\frac{3}{2}x^2 - \frac{1}{2}$

20. $(2x + 1)\sqrt{2x^2 + 2x + \sin(x^2 + x)}$

22. $\sin^5 x \cos x + \cos^5 x \sin x$

24. $(-1 - \sqrt{2}, -1 + \sqrt{2})$

40. $\frac{2}{3}$ (Hint: this limit defines a derivative)

42. $2x$

Problem Set 5.7

4. 22

10. 15

14. $-\frac{15}{14}$

16. $\frac{2}{3}$

22. $\frac{8}{3}$

24. $-\frac{1}{9}$

28. $-\frac{81}{8}$

36. $\frac{4}{5}$

50. $\int_0^2 (1 + x + x^2) dx = \frac{20}{3}$

Problem Set 5.8

4. $\frac{8}{145}(5u - \pi)^{29/8} + C$

8. $\frac{1}{\pi} \sin(\pi v - \sqrt{7}) + C$

10. $\frac{1}{30}(x^3 + 5)^{10} + C$

14. $\frac{1}{3} \sin(x^3 + 5) + C$

18. $\frac{3}{2} \sin \sqrt[3]{z^2 + 3} + C$

24. $-\frac{5}{18} [\tan(x^{-3} + 1)]^{6/5} + C$

30. $-\frac{1}{3} [u^{3/2}]_9^4 = \frac{19}{3}$

34. $\frac{1}{2} [u^{-2}]_1^{\sqrt{3}/2} = \frac{1}{6}$

42. $\frac{1}{\pi} [\sin u]_{-\pi}^{\pi} = 0$

52. 0 (odd function)