

EVEN ANSWERS for MTH 32

LESSON 1 (5.4) Riemann Sums

p. 306 4. $\int_0^3 (x^3 - 3x^2 + 1) dx$

20. $(2 + \sqrt{3})/6$

6. $\int_0^5 \sqrt{25 - x^2} dx$

46. -20

LESSON 2 (5.5) Evaluation of Integrals

p. 316 36. $1/2$

38. $1/3$

40. $1/4$

42. $2/\pi$

54. Use Comparison property (2), p. 315.

LESSON 3 (5.6) Fundamental Theorem of Calculus

p. 325 16. $58/7$

20. $5/2$

24. $(7 - 4\sqrt{2})/3$

56. $|\cos x| \cos x$

LESSON 4 (5.7) Substitution

p. 333 16. $1/5(3 - 5x) + C$

36. $-2/(1 + \sqrt{x}) + C$

54. -1

LESSON 5 (5.9) Numerical Integration

p. 357 2. $T_5 = 2.34$; exact value = $7/3$

6. $T_4 = 1.90$; exact value = 2

24a. $\approx 14.33^\circ \text{C}$.

26. Show $\int_1^{2.7} (1/x) dx < 1 < \int_1^{2.8} (1/x) dx$.

$\int_1^{2.7} (1/x) dx < T_{10} < .9954$ and $1.0250 < M_5 < \int_1^{2.8} (1/x) dx$

LESSON 6 (6.1) Setting Up Integrals

p. 374 2. $1/2$

8. $26/3$

14. $\int_{-2}^3 2p x \sqrt{1 + [f(x)]^2} dx$

18. $200/\pi$

LESSON 7 (6.2) Volume

- p. 384** 2. 8π 16. $16\pi/3$ 22. $640\pi/3$ 36. $4\pi ab^2/3$
38. $V_b = \pi(1 - 1/b^3)/3$; $V = \lim_{b \rightarrow \infty} V_b = \pi/3$ 42. $9/70$

LESSON 8 (6.4) Arcs and Surfaces

- p. 404** 6. $\int_0^1 \sqrt{4y^2 - 16y + 17} dy$ 12. $\int_0^4 2\pi x \sqrt{1 + 4x^2} dx$
14. $\int_0^1 2\pi (4 - x^2) \sqrt{1 + 4x^2} dx$ 24. $33/16$
30. $\pi(145 \sqrt{145} - 10 \sqrt{10})/27 \approx 199.48$ 32. $67\pi/10$
40. $4\pi r^2$ 42. $12\pi/5$

LESSON 9 (6.6) Force and Work

- p. 413** 2. 32 10. $78,000\pi \approx 245,044.23$ ft-lbs
12. $39,000\pi \approx 122,522.11$ ft-lbs 16a. $40,500\pi \approx 127,234.5$ ft-lbs
18. $2,125,000\pi \approx 6,675,884.4$ ft-lbs 20. 1250 ft-lbs
26. $21,600\pi \approx 67,858.4$ ft-lbs 28. 1087.5 ft-lbs 30. $W = \rho(4/3)\pi R^3 H$

LESSON 10 Review

- p. 362** 44. $-9/2$ 46. $1/11$
p. 424 10. $22/105$ 24. (a) $23\pi/9$ (b) $256\pi/15$ 32. 29,687.5 ft-lbs.
34. $25\pi/8$ ft-lbs.

LESSON 11 (7.1, 4) Inverse Functions and $\ln x$

- p. 439** 26. $2 \cot x$ 30. $1/(x \ln x)$ 40. $1/(x^2 - 1)$
p. 486 40. $(2/3)\ln(1 + x^{3/2}) + C$ 46. $-1/\ln x + C$ 48. $(2/3)(1 + \ln x)^{3/2} + C$

LESSON 12 (7.1, 4) Exponential Functions

- p. 439** 14. $e^{-1/x} / x^2$ 20. $(e^{-x} - e^x) \sin(e^x + e^{-x})$ 62. $y - e^{-2} = e^{-3}(e - x)$
- p. 485** 6. $1/t + 2t$ 14. $1/(e^y + ye^y)$ 42. $\ln(e^x + e^{-x}) + C$
44. $(1/2)e^{-1/x^2} + C$
- p. 440** 48. $x^x(1 + \ln x)$ 50. $\frac{(1+x)^{1/x}(x - (1+x)\ln(1+x))}{x^2(1+x)}$
- p. 465** 2. $(-2)(2^{1/x^2})(\ln 2) / x^3$ 22. $\pi^x \ln \pi + \pi x^{\pi-1}$ 26. $-10^{-x^2} / 2 \ln 10 + C$
40. $\lim_{x \rightarrow 0^+} f(x) = 0$ and $\lim_{x \rightarrow 0^-} f(x) = 1$

LESSON 13 (9.1) Growth and Decay

- p. 556** 22. 51,840 24. $\approx 14,734$ yrs. 26. \$14,723.40
28. ≈ 2584.57 mg. 36. $\approx 119,887$ yrs. 38. ≈ 723 yrs.

LESSON 14 (9.3) Separable Differential Equations

- p. 574** 32. ≈ 67 min. 38. $\approx 10:29$ am
40. (a) $x(t) = 10,000(10 - 8 \times 2^{-t/15})$ (b) March 31 (c) $\lim_{x \rightarrow \infty} x(t) = 100,000$
- p. 619** 32. ≈ 63 min.

LESSON 15 (7.2,3) l'Hopital's Rule

- p. 448** 4. 3 6. $1/2$ 14. ∞ 44. $1/(2\sqrt{3})$
- p. 453** 14. $1/2$ 22. e^{-1} 26. $e^{2/3}$

LESSON 16 (7.5) Inverse Trigonometric Functions

- p. 475** 4. (a) 0 (b) π (c) $\pi/3$ (d) $3\pi/4$
6. $e^x/(1 + e^{2x})$ 8. $1/[(1 + x^2) \tan^{-1} x]$ 32. $\pi/6$
34. $-\pi/6$ 42. $(1/15)\tan^{-1}(x^3/5) + C$
44. $(2/3)\tan^{-1}(x^{3/2}) + C$ 50. $(1/2)(\tan^{-1} x)^2 + C$ 52. $(1/4) \ln 2$

LESSON 17 (7.6) Hyperbolic Functions

- p. 483** 12. $4 \sinh^3 x \cosh x$ 16. $(1/2)(u + (1/6)\sinh 6u) + C$
 28. $\ln|e^x - e^{-x}| + C$ or $\ln|\sinh x| + C$ 46. $(1/2) \cosh^{-1}(x^2) + C$
 54. $(\pi/8)(e^{2\pi} - e^{-2\pi}) - (\pi^2/2) \approx 205.35$ 56. (a) 1 (b) 1 (c) 1/2

LESSON 18 Review

- p. 454** 30. 0
p. 486 22. $(\ln x)^{\ln x} \left(\frac{1 + \ln \ln x}{x} \right)$ 28. 0 32. -2 36. 1
 50. $(3/2)\ln(1 + x^{2/3}) + C$ 54. $(2e^2 - 1)/4$ 58. $e^t / (1 + e^{2t})$
 82. $(1/6) \tan^{-1}(2x/3) + C$ 92. $(1/2)\cosh^{-1}(2x) + C$

LESSON 19 (8.3) Integration by Parts

- p. 499** 4. $-t^2 \cos t + 2t \sin t + 2 \cos t + C$ 6. $(1/2)x^2 \ln x - (1/4)x^2 + C$
 8. $(1/6)[\sin 3z + \cos 3z]e^{3z} + C$ 10. $-(1/x)[\ln x + 1] + C$
 20. $(t/2)[\sin(\ln t) - \cos(\ln t)] + C$ 22. $x \ln(1 + x^2) - 2x + 2 \tan^{-1} x + C$
 24. $(1/2)(x^2 - 1) \tan^{-1} x^{1/2} - (1/6)x^{3/2} + (1/2)x^{1/2} + C$
 48. $-(1/8)(\sin 3x)(\sin x) - (3/8)(\cos 3x)(\cos x) + C$

LESSON 20 (8.4) Trigonometric Integrals

- p. 507** 1. $(1/2)[x - (1/4) \sin 4x] + C$ 4. $2 \tan(x/2) - x + C$
 5. $(-1/3) \ln|\cos 3x| + C$ or $(1/3) \ln|\sec 3x| + C$
 8. $(-1/2) \ln|\csc 2x + \cot 2x| + C = (1/2) \ln|\csc 2x - \cot 2x| + C$
 12. $(3/8)x - (1/4)\sin 2x + (1/32)\sin 4x + C$

$$25. (-1/4) \csc^2 2x - (1/2) \ln | \sin 2x | + C$$

$$28. (-1/4) \cot^4 x + C$$

$$30. \tan t - \cot t + C$$

$$34. (1/2) \tan 2x + (1/6) \tan^3 2x + C$$

$$38. (1/3) \tan^3 x - \tan x + x + C$$

$$44. -\csc x - \cot x + C$$

$$56. L = \int_0^{p/4} \sec x \, dx = \ln(1 + \sqrt{2})$$

LESSON 21 (8.5) Partial Fractions

p. 514 5. $(1/5)(\ln |x - 2| - \ln |x + 3|) + C$

$$6. x^2/2 - x + (27/5) \ln |x + 3| + (8/5) \ln |x - 2| + C$$

$$10. (1/3) \tan^{-1} x - (1/6) \tan^{-1}(x/2) + C$$

$$32. (1/4)[\ln |x - 1| - \ln |x + 1|] + (1/2) \tan^{-1} x + C$$

$$38. (1/5)[\ln |\sin \theta - 3| - \ln |\sin \theta + 2|] + C$$

p. 595 16. $\ln [(2N)/(15000 - N)] = (3/20)t$; $t = (20/3) \ln 4 \approx 9.24$ days

LESSON 22 (8.6) Trigonometric Substitution

p. 519 4. $(\sqrt{x^2 - 25})/(25x) + C$

$$38. (1/2)(x\sqrt{1+x^2} + \sinh^{-1} x) + C$$

$$54. \int_2^5 \sqrt{\frac{x}{x-1}} \, dx = \sqrt{x} \sqrt{x-1} + \ln |\sqrt{x} + \sqrt{x-1}| \Big|_2^5 \approx 3.620$$

LESSON 23 (8.7) Integrals with Quadratics

p. 524 4. $-(1/2)[(x + 3)/(x^2 + 4x + 5) + \tan^{-1}(x + 2)] + C$

$$6. 2 \sin^{-1}((x + 1)/2) - \sqrt{3 - 2x - x^2} + C$$

$$21. (7x - 12)/(9\sqrt{6x - x^2}) + C$$

$$46. (1/12)[\ln |x + 2| + \sqrt{3} \tan^{-1}((x - 1)/\sqrt{3}) - (1/2) \ln (x^2 - 2x + 4)] + C$$

LESSON 24 (8.8) Improper Integrals

- p. 537** 16. 0 18. $1/e$ 28. diverges 30. diverges
32. 1 44. For $k > 1$, $\int_1^{\infty} \frac{dx}{x^k} = \frac{1}{k-1}$ 50. π

LESSON 25 (11.1, 2) Infinite Sequences

- p. 689** 2. $a_n = 5n - 3$ 4. $a_n = (-1)^{n+1}/2^{n-1}$ 6. $a_n = 1/(n^2 + 1)$
8. $a_n = 7.5 + (-1)^{n+1}2.5$ 12. diverges 16. 0
18. 0 24. diverges 28. 1

LESSON 26 (11.3) Infinite Series

- p. 699** 2. converges with sum $e/(e-1)$ 4. diverges (n^{th} term test)
10. diverges (n^{th} term test) 14. converges with sum 2
16. diverges 18. diverges (n^{th} term test)
20. diverges (n^{th} term test)
50. $S_n = 1/2 - 1/(4n+2)$; $\lim_{n \rightarrow \infty} S_n = 1/2$; series converges with sum $1/2$.
52. $S_n = \ln(n+1)$; $\lim_{n \rightarrow \infty} S_n = \infty$ and the series diverges
70. Peter (36/91); Paul (30/91); Mary (25/91)

LESSON 29 (11.5) Integral Test

- p. 720** 4. converges 24. converges 28. converges 30. diverges

LESSON 30 (11.6) Comparison Tests

- p. 727** 2. diverges 4. converges 6. converges 10. diverges
12. converges 16. converges 22. diverges 28. converges
34. converges

LESSON 31 (11.7) Alternating Series

- p. 735** 4. converges 8. converges 18. diverges

51. $\sum_{n=0}^5 \frac{(-1)^n}{(2n)!} \approx .6065$ (6 terms) 52. $\sum_{n=0}^4 \frac{(-1)^n}{(2n)!} \approx .54030$ (5 terms)

54. $\sum_{n=1}^6 \frac{(-1)^{n+1}}{n10^n} \approx .0953102$ (6 terms)

LESSON 32 (11.7) Ratio and Root Tests

- p. 735** 20. converges 28. converges absolutely 32. diverges
36. converges absolutely 42. converges absolutely

LESSON 33 (11.8) Power Series

- p. 748** 4. $-5 < x \leq 5$ 6. $-\infty < x < \infty$ 14. $(-1/4) < x \leq (1/4)$

16. $0 \leq x \leq 1$ 32. $\sum_{n=0}^{\infty} \frac{(-1)^n x^n}{10^{n+1}} ; R = 10$

38. $1 + (3/2)x^2 + (3/2)(1/2)x^4/2! + (3/2)(1/2)(-1/2)x^6/3!$
 $+ (3/2)(1/2)(-1/2)(-3/2)x^8/4! + \dots ; R = 1$

44. $x - x^3/3!3 + x^5/5!5 - x^7/7!7 + \dots = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{(2n+1)!(2n+1)}$

50. $2x^2/(1-x)^3$ 52. $2; 3/2$

LESSON 34 (11.9) Power Series Computations

- p. 756**
- | | | |
|----------------------|--------------------|--------------------|
| 4. 4 terms; .819 | 6. 2 terms; .095 | 16. 3 terms; .4970 |
| 20. 3 terms; .4864 | 21. 4 terms; .5133 | 24. $1/6$ 28. 2 |
| 31. 4 terms; .681998 | 34. 10 places | 36. 3 places |

LESSON 35(11.10) Series Solutions of Differential Equations

p. 766

LESSON 36 Review

- p. 767**
- | | | | |
|--|---------------|---------------|---------------|
| 16. diverges | 18. converges | 20. converges | 30. converges |
| 32. $(-2/3, 2/3)$ | 38. $[-1, 1)$ | 40. $(0, 2)$ | |
| 60. $a_0 = 0, a_1 = 1, a_2 = 0, a_3 = 1/3$ | | | |