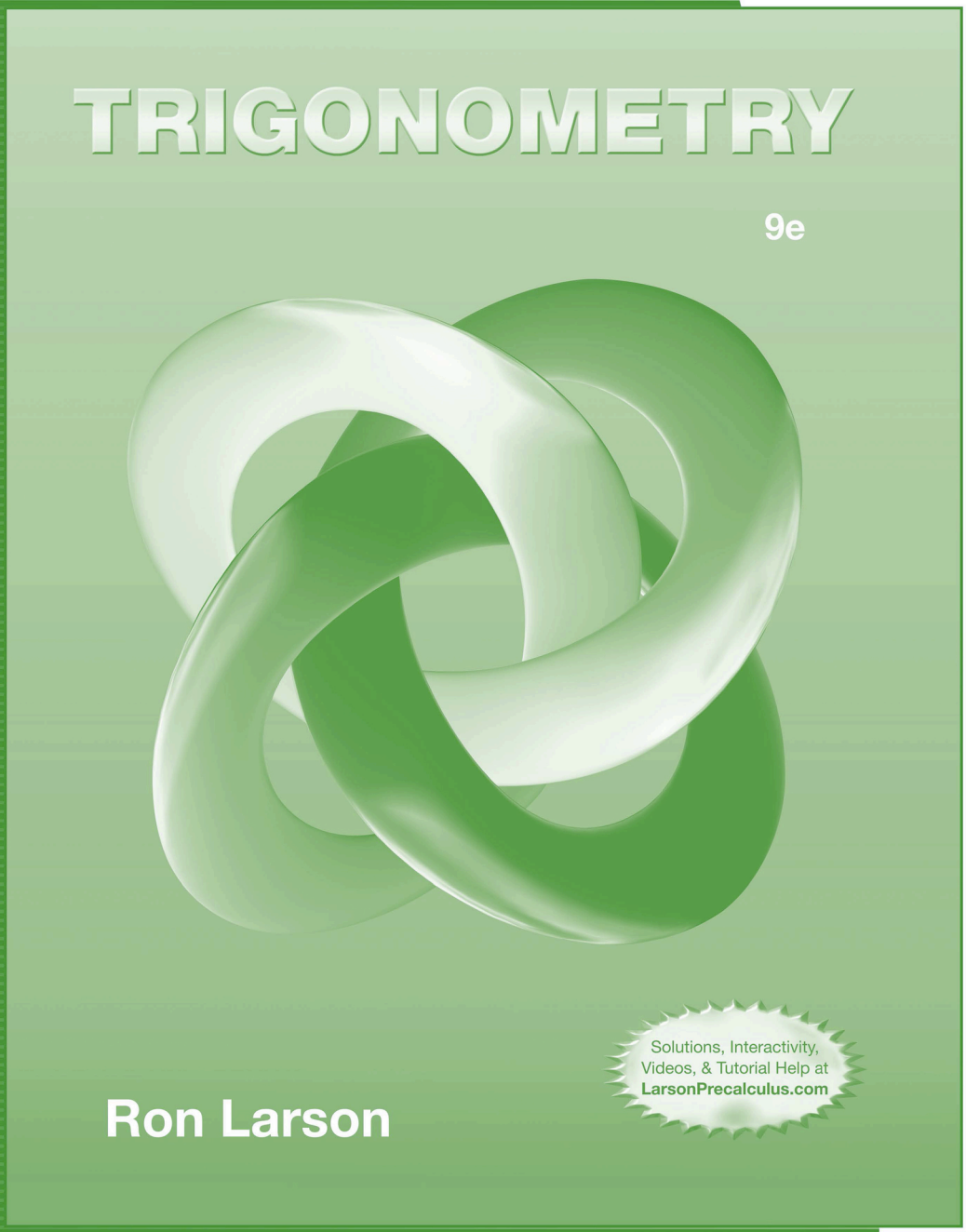
Student Study and Solutions Manual



Student Study and Solutions Manual

Trigonometry

NINTH EDITION

Ron Larson
The Pennsylvania State University,
The Behrend College

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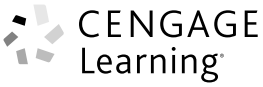

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Prerequisites

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Section P.1 Review of Real Numbers and Their Properties

1. irrational

3. absolute value

5. terms

7. $-9, -\frac{7}{2}, 5, \frac{2}{3}, \sqrt{2}, 0, 1, -4, 2, -11$

(a) Natural numbers: 5, 1, 2

(b) Whole numbers: 0, 5, 1, 2

(c) Integers: $-9, 5, 0, 1, -4, 2, -11$

(d) Rational numbers: $-9, -\frac{7}{2}, 5, \frac{2}{3}, 0, 1, -4, 2, -11$

(e) Irrational numbers: $\sqrt{2}$

9. $2.01, 0.666\ldots, -13, 0.010110111\ldots, 1, -6$

(a) Natural numbers: 1

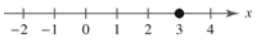
(b) Whole numbers: 1

(c) Integers: $-13, 1, -6$

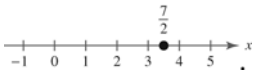
(d) Rational numbers: $2.01, 0.666\ldots, -13, 1, -6$

(e) Irrational numbers: $0.010110111\ldots$

11. (a)



(b)



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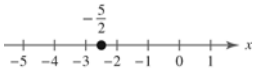
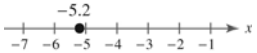
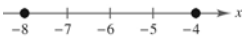


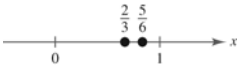
(d)



13. $-4 > -8$

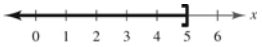


15. $\frac{5}{6} > \frac{2}{3}$



17. (a) The inequality $x \leq 5$ denotes the set of all real numbers less than or equal to 5.

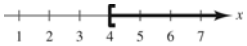
(b)



(c) The interval is unbounded.

19. (a) The interval $[4, \infty)$ denotes the set of all real numbers greater than or equal to 4.

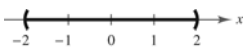
(b)



(c) The interval is unbounded.

21. (a) The inequality $-2 < x < 2$ denotes the set of all real numbers greater than -2 and less than 2.

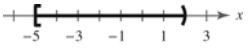
(b)



(c) The interval is bounded.

23. (a) The interval $[-5, 2)$ denotes the set of all real numbers greater than or equal to -5 and less than 2.

(b)



(c) The interval is bounded.

25. $y \geq 0; [0, \infty)$

27. $10 \leq t \leq 22; [10, 22]$

29. $W > 65; (65, \infty)$

31. $|-10| = -(-10) = 10$

33. $|3 - 8| = |-5| = -(-5) = 5$

35. $|-1| - |-2| = 1 - 2 = -1$

37. $\frac{-5}{|-5|} = \frac{-5}{-(-5)} = \frac{-5}{5} = -1$

39. If $x < -2$, then $x + 2$ is negative.

So, $\frac{|x + 2|}{x + 2} = \frac{-(x + 2)}{x + 2} = -1.$

41. $|-4| = |4|$ because $|-4| = 4$ and $|4| = 4$.

43. $-|-6| < |-6|$ because $|-6| = 6$ and $-|-6| = -(6) = -6$.

45. $d(126, 75) = |75 - 126| = 51$

47. $d\left(-\frac{5}{2}, 0\right) = \left|0 - \left(-\frac{5}{2}\right)\right| = \frac{5}{2}$

49. $d\left(\frac{16}{5}, \frac{112}{75}\right) = \left|\frac{112}{75} - \frac{16}{5}\right| = \frac{128}{75}$

51. $d(x, 5) = |x - 5|$ and $d(x, 5) \leq 3$, so $|x - 5| \leq 3$.

	Receipts, R	**Expenditures, E**	$\lvert \mathbf{R} - \mathbf{E} \rvert$
55.	\$1880.1	\$2292.8	$\lvert 1880.1 - 2292.8 \rvert$ = \$412.7 billion
57.	\$2524.0	\$2982.5	$\lvert 2524.0 - 2982.5 \rvert$ = \$458.5 billion

59. $7x + 4$

Terms: $7x$, 4

Coefficient: 7

61. $4x^3 + \frac{x}{2} - 5$

Terms: $4x^3, \frac{x}{2}, -5$

Coefficients: $4, \frac{1}{2}$

63. $4x - 6$

(a) $4(-1) - 6 = -4 - 6 = -10$

(b) $4(0) - 6 = 0 - 6 = -6$

65. $-x^2 + 5x - 4$

(a) $-(-1)^2 + 5(-1) - 4 = -1 - 5 - 4 = -10$

(b) $-(1)^2 + 5(1) - 4 = -1 + 5 - 4 = 0$

67. $\frac{1}{(h + 6)}(h + 6) = 1, h \neq -6$

Multiplicative Inverse Property

69. $2(x + 3) = 2 \cdot x + 2 \cdot 3$

Distributive Property

71. $x(3y) = (x \cdot 3)y$ Associative Property of Multiplication

$= (3x)y$ Commutative Property of Multiplication

73. $\frac{5}{8} - \frac{5}{12} + \frac{1}{6} = \frac{15}{24} - \frac{10}{24} + \frac{4}{24} = \frac{9}{24} = \frac{3}{8}$

75. $\frac{2x}{3} - \frac{x}{4} = \frac{8x}{12} - \frac{3x}{12} = \frac{5x}{12}$

77. (a) Because $A > 0, -A < 0$.
The expression is negative.

(b) Because $B < A, B - A < 0$.
The expression is negative.

(c) Because $C < 0, -C > 0$.
The expression is positive.

(d) Because $A > C, A - C > 0$.
The expression is positive.

79. False. Because 0 is nonnegative but not positive, not every nonnegative number is positive.

81. (a)

n	0.0001	0.01	1	100	10,000
$5/n$	50,000	500	5	0.05	0.0005

(b) (i) As n approaches 0, the value of $5/n$ increases without bound (approaches infinity).

(ii) As n increases without bound (approaches infinity), the value of $5/n$ approaches 0.

Section P.2 Solving Equations

1. equation

3. extraneous

5. $x + 11 = 15$

$x + 11 - 11 = 15 - 11$

$x = 4$

7. $7 - 2x = 25$

$7 - 7 - 2x = 25 - 7$

$-2x = 18$

$\frac{-2x}{-2} = \frac{18}{-2}$

$x = -9$

9. $4y + 2 - 5y = 7 - 6y$
$4y - 5y + 2 = 7 - 6y$
$-y + 2 = 7 - 6y$
$-y + 6y + 2 = 7 - 6y + 6y$
$5y + 2 = 7$
$5y + 2 - 2 = 7 - 2$
$5y = 5$
$\frac{5y}{5} = \frac{5}{5}$
$y = 1$

11. $x - 3(2x + 3) = 8 - 5x$
$x - 6x - 9 = 8 - 5x$
$-5x - 9 = 8 - 5x$
$-5x + 5x - 9 = 8 - 5x + 5x$
$-9 \neq 8$

No solution

13. $\frac{3x}{8} - \frac{4x}{3} = 4$
$\frac{9x}{24} - \frac{32x}{24} = 4$
$-\frac{23x}{24} = 4$
$-\frac{23x}{24}\left(-\frac{24}{23}\right) = 4\left(-\frac{24}{23}\right)$
$x = -\frac{96}{23}$

or

$\frac{3x}{8} - \frac{4x}{3} = 4$
$24\left(\frac{3x}{8} - \frac{4x}{3}\right) = 24(4)$
$9x - 32x = 96$
$-23x = 96$
$x = -\frac{96}{23}$

The second method is easier. The fractions are eliminated in the first step.

15. $\frac{5x - 4}{5x + 4} = \frac{2}{3}$
$3(5x - 4) = 2(5x + 4)$
$15x - 12 = 10x + 8$
$5x = 20$
$x = 4$

17. $10 - \frac{13}{x} = 4 + \frac{5}{x}$
$\frac{10x - 13}{x} = \frac{4x + 5}{x}$
$10x - 13 = 4x + 5$
$6x = 18$
$x = 3$

19. $\frac{x}{x + 4} + \frac{4}{x + 4} + 2 = 0$
$\frac{x + 4}{x + 4} + 2 = 0$
$1 + 2 = 0$
$3 \neq 0$

Contradiction; no solution

21. $\frac{2}{(x - 4)(x - 2)} = \frac{1}{x - 4} + \frac{2}{x - 2}$ Multiply both sides by $(x - 4)(x - 2)$.
$2 = 1(x - 2) + 2(x - 4)$
$2 = x - 2 + 2x - 8$
$2 = 3x - 10$
$12 = 3x$
$4 = x$

A check reveals that $x = 4$ is an extraneous solution—it makes the denominator zero. There is no real solution.

23. $\frac{1}{x - 3} + \frac{1}{x + 3} = \frac{10}{x^2 - 9}$
$\frac{1}{x - 3} + \frac{1}{x + 3} = \frac{10}{(x + 3)(x - 3)}$ Multiply both sides by $(x + 3)(x - 3)$.
$1(x + 3) + 1(x - 3) = 10$
$2x = 10$
$x = 5$