Precalculus with Limits 6th edition Larson Solutions Manual

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Solution and Answer Guide

LARSON, PRECALCULUS 2027, 9798214407050;
APPENDIX A: REVIEW OF FUNDAMENTAL CONCEPTS OF ALGEBRA

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APPENDIX A.1 REAL NUMBERS AND THEIR PROPERTIES

A.1.1.

irrational

A.1.2.

Origin

A.1.3.

terms

A.1.4.

Zero-Factor Property

A.1.5.

Yes. $|3-10|=|-7|=7$ and $|10-3|=|7|=7$.

A.1.6.

(a) iii
(b) iv
(c) ii
(d) v
(e) i

A.1.7.

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

(a) Natural numbers: 5, 8, 2
(b) Whole numbers: 5, 0, 8, 2
(c) Integers: $-9, 5, 0, 8, -4, 2, -11$
(d) Rational numbers: $-9, -\frac{7}{2}, 5, \frac{2}{3}, 0, 8, -4, 2, -11$
(e) Irrational numbers: $\sqrt{3}$

A.1.8.

$\sqrt{5}, -7, -\frac{7}{3}, 0, 3.14, \frac{5}{4}, -3, 12, 5$

(a) Natural numbers: 12, 5
(b) Whole numbers: 0, 12, 5
(c) Integers: $-7, 0, -3, 12, 5$
(d) Rational numbers: $-7, -\frac{7}{3}, 0, 3.14, \frac{5}{4}, -3, 12, 5$
(e) Irrational numbers: $\sqrt{5}$

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A.1.9.

$2.01,\ 0.\overline{6},\ -13,\ 0.010110111\ldots,\ 1,\ -6$

(a) Natural numbers: 1

(b) Whole numbers: 1

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

(d) Rational numbers: $2.01,\ 0.\overline{6},\ -13,\ 1,\ -6$

(e) Irrational numbers: $0.010110111\ldots$

A.1.10.

$25,\ -17,\ -\frac{12}{5},\ \sqrt{9},\ 3.12,\ \frac{1}{2}\pi,\ 18,\ -11.1,\ 13$

(a) Natural numbers: $25,\ \sqrt{9}=3,\ 18,\ 13$

(b) Whole numbers: $25,\ \sqrt{9}=3,\ 18,\ 13$

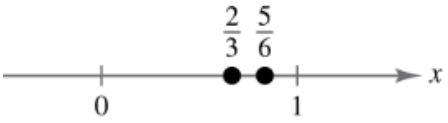
(c) Integers: $25,\ -17,\ \sqrt{9}=3,\ 18,\ 13$

(d) Rational numbers: $25,\ -17,\ -\frac{12}{5},\ \sqrt{9}=3,\ 3.12,\ 18,\ -11.1,\ 13$

(e) Irrational numbers: $\frac{1}{2}\pi$

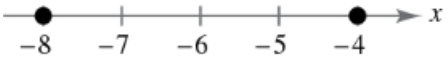
A.1.11.

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



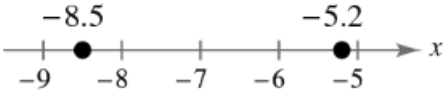
A.1.12.

$-4 > -8$



A.1.13.

$-5.2 > -8.5$

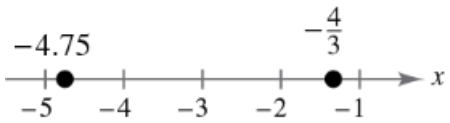


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A.1.14.

$-\frac{4}{3} > -4.75$



A.1.15.

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

A.1.16.

The inequality $x < 0$ denotes the set of all real numbers less than zero.

A.1.17.

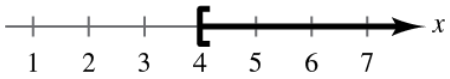
The inequality $-2 < x < 2$ denotes the set of all real numbers greater than -2 and less than 2.

A.1.18.

The inequality $0 < x \leq 6$ denotes the set of all positive real numbers less than or equal to 6.

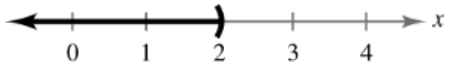
A.1.19.

The interval $[4, \infty)$ denotes the set of all real numbers greater than or equal to 4; $x \geq 4$.



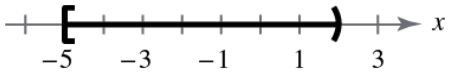
A.1.20.

The interval $(-\infty, 2)$ denotes the set of all real numbers less than 2; $x < 2$.



A.1.21.

The interval $[-5, 2)$ denotes the set of all real numbers greater than or equal to -5 and less than 2; $-5 \leq x < 2$.

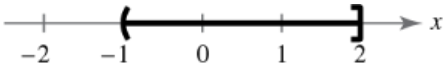


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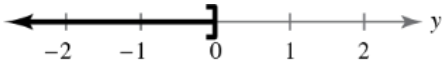
A.1.22.

The interval $(-1, 2]$ denotes the set of all real numbers greater than -1 and less than or equal to 2; $-1 < x \leq 2$.



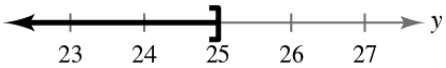
A.1.23.

$(-\infty, 0]$; $y \leq 0$



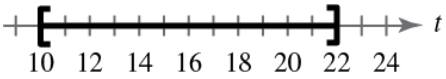
A.1.24.

$(-\infty, 25]$; $y \leq 25$



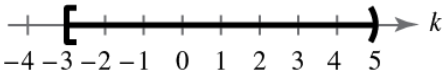
A.1.25.

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



A.1.26.

$[-3, 5)$; $-3 \leq k < 5$



A.1.27.

$|-10| = -(-10) = 10$

A.1.28.

$|0| = 0$

A.1.29.

$|-1| - |-2| = 1 - 2 = -1$

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A.1.30.

$$-3-\left|-3\right|=-3-\left(3\right)=-6$$

A.1.31.

$$5\ \left|-5\right|=5\left(5\right)=25$$

A.1.32.

$$-4\ \left|-4\right|=-4\left(4\right)=-16$$

A.1.33.

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

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

A.1.34.

If $x>1$, then $x-1$ is positive.

So, $\dfrac{\left|x-1\right|}{x-1}=\dfrac{x-1}{x-1}=1.$

A.1.35.

$\left|-4\right|=\left|4\right|$ because $\left|-4\right|=4$ and $\left|4\right|=4.$

A.1.36.

$-5=-\left|5\right|$ because $-5=-5.$

A.1.37.

$-\left|-6\right|<\left|-6\right|$ because $\left|-6\right|=6$ and $-\left|-6\right|=-\left(6\right)=-6.$

A.1.38.

$-\left|-2\right|=-\left|2\right|$ because $-2=-2.$

A.1.39.

$$d\left(126,\ 75\right)=\left|75-126\right|=51$$

A.1.40.

$$d\left(-20,\ 30\right)=\left|30-\left(-20\right)\right|=\left|50\right|=50$$

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A.1.41.

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

A.1.42.

$$d\left(-\tfrac{1}{4}, -\tfrac{11}{4}\right) = \left|-\tfrac{11}{4} - \left(-\tfrac{1}{4}\right)\right| = \left|-\tfrac{5}{2}\right| = \tfrac{5}{2}$$

A.1.43.

$7x + 4$
Terms: $7x,\ 4$
Coefficient: 7

A.1.44.

$6x^3 - 5x$
Terms: $6x^3,\ -5x$
Coefficients: $6,\ -5$

A.1.45.

$4x^3 + 0.5x - 5$
Terms: $4x^3,\ 0.5x,\ -5$
Coefficients: $4,\ 0.5$

A.1.46.

$3\sqrt{3}x^2 + 1$
Terms: $3\sqrt{3}x^2,\ 1$
Coefficient: $3\sqrt{3}$

A.1.47.

Receipts: R = \$3268.0 billion
Expenditures: E = \$3852.6 billion
$|R - E| = |3268.0 - 3852.6| = |-584.6| =$ \$584.6 billion

A.1.48.

Receipts: R = \$3329.9 billion
Expenditures: E = \$4109.0 billion
$|R - E| = |3329.9 - 4109.0| = |-779.1| =$ \$779.1 billion

A.1.49.

Receipts: R = \$3421.2 billion
Expenditures: E = \$6553.6 billion
$|R - E| = |3421.2 - 6553.6| = |-3132.4| =$ \$3132.4 billion

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A.1.50.

Receipts: R = \$4897.3 billion
Expenditures: E = \$6273.3 billion
$|R-E|=|4897.3-6273.3|=|-1376.0|=\$1376.0$ billion

A.1.51.

x^2-3x+2

(a) $(0)^2-3(0)+2=2$

(b) $(-1)^2-3(-1)+2=1+3+2=6$

A.1.52.

$\dfrac{x-2}{x+2}$

(a) $\dfrac{2-2}{2+2}=\dfrac{0}{4}=0$

(b) $\dfrac{-2-2}{-2+2}=\dfrac{-4}{0}$

Division by zero is undefined.

A.1.53.

$\dfrac{2x}{3}-\dfrac{x}{4}=\dfrac{8x}{12}-\dfrac{3x}{12}=\dfrac{5x}{12}$

A.1.54.

$\dfrac{3x}{4}+\dfrac{x}{5}=\dfrac{15x}{20}+\dfrac{4x}{20}=\dfrac{19x}{20}$

A.1.55.

$\dfrac{3x}{10}\cdot\dfrac{5}{6}=\dfrac{x}{2}\cdot\dfrac{1}{2}=\dfrac{x}{4}$

A.1.56.

$\dfrac{2x}{3}\div\dfrac{6}{7}=\dfrac{2x}{3}\cdot\dfrac{7}{6}=\dfrac{x}{3}\cdot\dfrac{7}{3}=\dfrac{7x}{9}$

A.1.57.

False. Because zero is nonnegative but not positive, not every nonnegative number is positive.

A.1.58.

The product of two negative numbers is positive.

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A.1.59.

The distributive law was used incorrectly. The 5 was not distributed to the 3.

A.1.60.

(a) Because the price can only be a positive rational number with at most two decimal places, the description matches graph (ii).
A range of prices can only include zero and positive numbers with at most two decimal places. So, a range of prices can be represented by whole numbers and some noninteger positive fractions.

(b) Because the distance is a positive real number, the description matches graph (i).
A range of lengths can only include positive numbers. So, a range of lengths can be represented by positive real numbers.

A.1.61.

$5/n$ increases or decreases without bound. As n approaches 0, $5/n$ increases when n is positive and decreases when n is negative.

A.1.62.

$5/n$ approaches 0 as n increases without bound. As n increases, $5/n$ decreases but stays positive.

A.1.63.

$6 = 2 \cdot 3, 8 = 2 \cdot 2 \cdot 2$

(a) Greatest common factor: 2

(b) Least common multiple: $2 \cdot 2 \cdot 2 \cdot 3 = 24$

A.1.64.

$10 = 2 \cdot 5, 25 = 5 \cdot 5$

(a) Greatest common factor: 5

(b) Least common multiple: $2 \cdot 5 \cdot 5 = 50$

A.1.65.

$27 = 3 \cdot 3 \cdot 3, 36 = 2 \cdot 2 \cdot 3 \cdot 3, 54 = 2 \cdot 3 \cdot 3 \cdot 3$

(a) Greatest common factor: $3 \cdot 3 = 9$

(b) Least common multiple: $2 \cdot 2 \cdot 3 \cdot 3 \cdot 3 = 108$

A.1.66.

$49 = 7 \cdot 7, 98 = 2 \cdot 7 \cdot 7, 112 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 7$

(a) Greatest common factor: 7

(b) Least common multiple: $2 \cdot 2 \cdot 2 \cdot 2 \cdot 7 \cdot 7 = 784$

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A.1.67.

$$-(3 \cdot 3) = -9$$

A.1.68.

$$(-3)(-3) = 3 \cdot 3 = 9$$

A.1.69.

$$\frac{(-5)(-5)}{-5} = -5$$

A.1.70.

$$\frac{-(5 \cdot 5)}{(-5)(-5)(-5)} = \frac{5 \cdot 5}{5 \cdot 5 \cdot 5} = \frac{1}{5}$$

A.1.71.

$$48 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 = 2^4 \cdot 3$$

A.1.72.

$$250 = 2 \cdot 5 \cdot 5 \cdot 5 = 2 \cdot 5^3$$

A.1.73.

$$792 = 8 \cdot 9 \cdot 11 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 11 = 2^3 \cdot 3^2 \cdot 11$$

A.1.74.

$$4802 = 2 \cdot 7 \cdot 7 \cdot 7 \cdot 7 = 2 \cdot 7^4$$

A.1.75.

$$3.785(10,000) = 37,850$$

A.1.76.

$$1.42(1,000,000) = 1,420,000$$

A.1.77.

$$\frac{6.09}{1000} = 0.00609$$

A.1.78.

$$\frac{8.603}{100,000} = 0.00008603$$

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APPENDIX A.2 EXPONENTS AND RADICALS

A.2.1.

exponent; base

A.2.2.

index; radicand

A.2.3.

An expression involving radicals is in simplest form when the following conditions are satisfied:

1. All possible factors have been removed from the radical.
2. All fractions have radical-free denominators.
3. The index of the radical is reduced.

A.2.4.

64 is both a perfect square $\left(8^2 = 64\right)$ and a perfect cube $\left(4^3 = 64\right)$.

A.2.5.

$$5 \cdot 5^3 = 5^4 = 625$$

A.2.6.

$$\begin{aligned}\left(2^3 \cdot 3^2\right)^2 &= 2^{3\cdot 2} \cdot 3^{2\cdot 2} \\ &= 2^6 \cdot 3^4 = 64 \cdot 81 = 5184\end{aligned}$$

A.2.7.

$$\frac{5^2}{5^4} = 5^{-2} = \frac{1}{5^2} = \frac{1}{25}$$

A.2.8.

$$\begin{aligned}\left(-\frac{3}{5}\right)^3\left(\frac{5}{3}\right)^2 &= \left(-1\right)^3 \frac{3^3}{5^3} \cdot \frac{5^2}{3^2} = -1 \cdot 3^{3-2} \cdot 5^{2-3} \\ &= -3 \cdot 5^{-1} = -\frac{3}{5}\end{aligned}$$

A.2.9.

$$-3^2 = -9$$

A.2.10.

$$\left(-4\right)^{-3} = \frac{1}{\left(-4\right)^3} = -\frac{1}{64}$$

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A.2.11.

$$\frac{4\cdot 3^{-2}}{2^{-2}\cdot 3^{-1}} = 4\cdot 2^{2}\cdot 3^{-2-(-1)} = 4\cdot 4\cdot 3^{-1} = \frac{16}{3}$$

A.2.12.

$$\frac{3}{3^{-4}} = 3\cdot 3^{4} = 3^{5} = 243$$

A.2.13.

When $x = 2$,

$$-3x^{3} = -3(2)^{3} = -24.$$

A.2.14.

When $x = 4$,

$$7x^{-2} = 7(4)^{-2} = \frac{7}{4^{2}} = \frac{7}{16}.$$

A.2.15.

When $x = 0.1$,

$$6x^{2} = 6(0.1)^{2} = 6(0.01) = 0.06.$$

A.2.16.

When $x = -\frac{1}{3}$,

$$12(-x)^{3} = 12\left(\tfrac{1}{3}\right)^{3} = 12\left(\tfrac{1}{27}\right) = \tfrac{4}{9}.$$

A.2.17.

$$6y^{2}\left(2y^{0}\right)^{2} = 6y^{2}\left(2\cdot 1\right)^{2} = 6y^{2}\left(4\right) = 24y^{2}$$

A.2.18.

$$\begin{aligned}(-z)^{3}\left(3z^{4}\right) &= (-1)^{3}\left(z^{3}\right)3z^{4}\\ &= -1\cdot 3\cdot z^{3+4} = -3z^{7}\end{aligned}$$

A.2.19.

$$\frac{7x^{2}}{x^{3}} = 7x^{2-3} = 7x^{-1} = \frac{7}{x}$$

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