

Chapter 0 A Precalculus Review

Section 0.1: The Real Line and Order

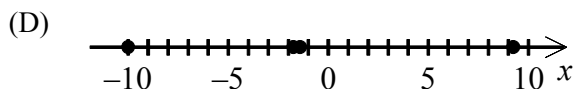
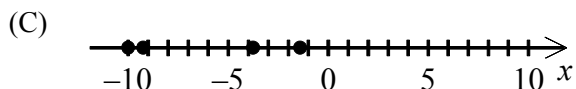
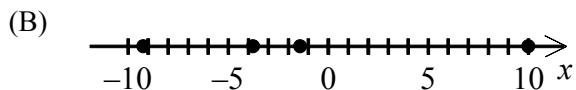
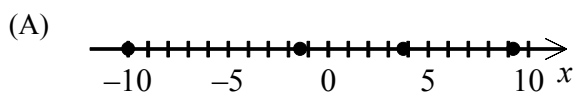
Objective 1: Represent, classify, and order real numbers.

1. Identify the integer numbers in the set $\left\{5, -\frac{7}{20}, -7, 10\pi, 15, 0.4, \sqrt{5}, -\frac{7}{25}\right\}$.

(A) $\sqrt{5}, 1.5, -\frac{7}{25}, 0.5$ (B) $10\pi, 1.5$ (C) $0.5, \sqrt{5}$ (D) $5, -7, 15$ (E) None of these

2. Identify the graph that shows the correct plot of the points.

$-3.75, 9.25, -10, -\sqrt{2}$



(E) None of these

3. Place the numbers in the correct order.

$-\pi, 5, -7, -\sqrt{3}$

(A) $5 > -\pi > -\sqrt{3} > -7$ (B) $-7 > -\pi > -\sqrt{3} > 5$ (C) $5 < -\pi < -\sqrt{3} < -7$

(D) $5 < -\sqrt{3} < -\pi < -7$ (E) None of these

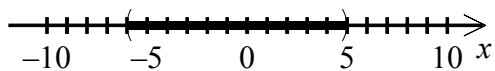
4. Write the rational number as the ratio of two integers.

$0.\overline{96}$

(A) $\frac{24}{25}$ (B) $\frac{48}{5}$ (C) $\frac{12}{125}$ (D) $\frac{48}{25}$ (E) None of these

Objective 2: Use inequalities to represent sets of real numbers.

5. Find the inequality that represents the graphed numbers.



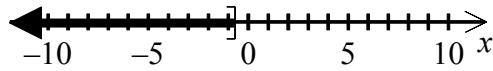
- (A) $x < -6$ or $x > 5$ (B) $-5 < x < 6$ (C) $x < -5$ or $x > 6$
 (D) $-6 < x < 5$ (E) None of these
6. Which of the following intervals is represented by $3 < x \leq 5$?
- (A) $(3, 5]$ (B) $[3, 5]$ (C) $(3, 5)$ (D) $[3, 5)$ (E) None of these
7. Which of the following inequalities represents the interval $(-3, -1]$?
- (A) $-3 \leq x \leq -1$ (B) $-3 > x \geq -1$ (C) $-3 \geq x > -1$
 (D) $-3 < x < -1$ (E) None of these
8. Identify the notation that denotes the statement that “ x is greater than 3 and no greater than 13.”
- (A) $3 < x \leq 13$ (B) $3 \leq x \leq 13$ (C) $3 < x < 13$ (D) $3 \leq x < 13$ (E) None of these

Objective 3: Solve inequalities.

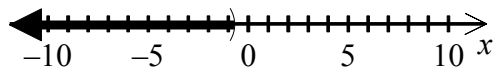
Which is the graph of the solution for the inequality?

9. $-3 - 4x \leq -1$

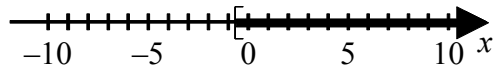
(A) $x \leq -\frac{1}{2}$



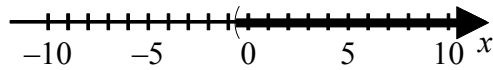
(B) $x < -\frac{1}{2}$



(C) $x \geq -\frac{1}{2}$



(D) $x > -\frac{1}{2}$

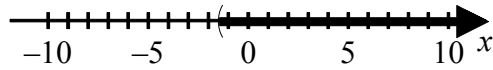


(E) None of these

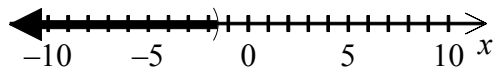
Which is the graph of the solution for the inequality?

10. $5x - 3 \leq 3(x - 2)$

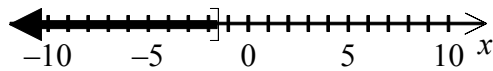
(A) $x > -\frac{3}{2}$



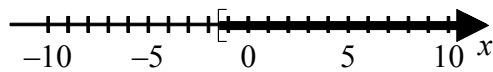
(B) $x < -\frac{3}{2}$



(C) $x \leq -\frac{3}{2}$



(D) $x \geq -\frac{3}{2}$

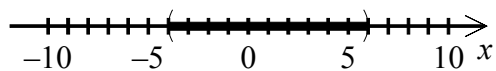


(E) None of these

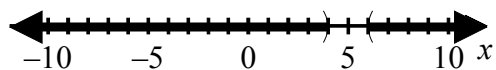
Which is the graph of the solution for the inequality?

11. $x^2 - 2x > 24$

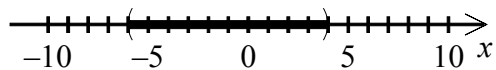
(A) $-4 < x < 6$



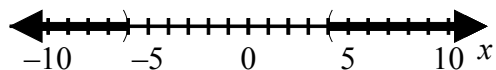
(B) $x < 4, x > 6$



(C) $-6 < x < 4$



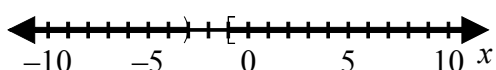
(D) $x < -6, x > 4$



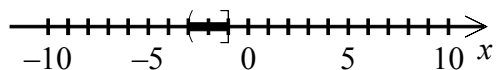
(E) None of these

12. $-3 \leq -3x - 6 < 3$

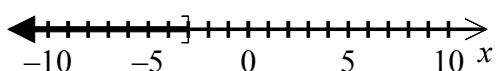
(A) $(-\infty, -3) \cup [-1, \infty)$



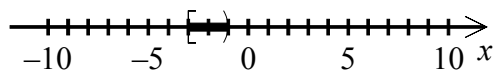
(B) $(-3, -1]$



(C) $(-\infty, -3]$



(D) $[-3, -1)$



(E) None of these

Objective 4: Use inequalities to model and solve real-life problems.

13. Adrienne is planning a 4-hour hike, and is looking for a park within a reasonable distance from her house. She can drive at an average of 35 miles per hour, but she does not want to spend more than 6 hours away from home. Which describes the possible one-way distance Adrienne can travel from her home to the park?

(A) $d \leq 105$ miles (B) $d \geq 70$ miles (C) $d \geq 105$ miles
 (D) $d \leq 70$ miles (E) None of these

14. Sean works weekends and earns \$5.30 per hour after deductions. He wants at least \$335 for a stereo system. Which is the fewest hours he must work to reach this goal?

(A) 66 hr (B) 65 hr (C) 63 hr (D) 64 hr (E) None of these

15. □ The force F applied to an elevator cable by the total weight w of the elevator can be determined by $F = 2.4w$, where F is in newtons. The sign in the elevator limits the total weight of passengers and baggage to 2500 kilograms. The empty elevator weighs 1100 kilograms. Which inequality expresses the possible range of the force on the elevator cable in newtons (N)?

(A) $1100 \text{ N} \leq F \leq 2500 \text{ N}$ (B) $2640 \text{ N} \leq F \leq 8640 \text{ N}$ (C) $2640 \text{ N} \leq F \leq 6000 \text{ N}$
 (D) $3740 \text{ N} \leq F \leq 8500 \text{ N}$ (E) None of these

16. □ A company's monthly cost C , in dollars, for storing x surplus units of a product is

$$C = 2000 + 0.9x.$$

Find the widest range of x values for which the monthly cost will not exceed \$4400.

(A) $x \leq 2676$ (B) $x \leq 2799$ (C) $x \leq 2716$ (D) $x \leq 2399$ (E) None of these

Section 0.2: Absolute Value and Distance on the Real Line

Objective 1: Find the absolute values of real numbers and understand the properties of absolute value.

Simplify the expression.

17. $|13 + (-2)|$

(A) 15 (B) -15 (C) 11 (D) -11 (E) None of these

18. $\frac{|-22|}{|30|}$

(A) $\frac{11}{15}$ (B) 8 (C) $\pm \frac{|11|}{15}$ (D) $\pm \frac{11}{15}$ (E) None of these

Simplify the expression.

19. $|-6| - |-12|$

- (A) 72 (B) 18 (C) ± 72 (D) $6|-12|$ (E) None of these

20. $|5^2|$

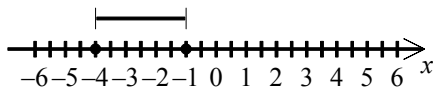
- (A) $\pm|5|^2$ (B) ± 25 (C) 25 (D) 10 (E) None of these

Objective 2: Find the distance between two numbers on the real line.

21. Katalin is on a mountain 11,033 feet above sea level. Nick is in a submarine 3414 feet below sea level. Which of the following can be used to find the difference between Katalin's elevation and Nick's elevation?

- (A) $|-3414| - |11,033|$ (B) $|11,033 - (-3414)|$ (C) $|11,033 - 3414|$
 (D) $|3414 - 11,033|$ (E) None of these

22. Which is an expression for the distance shown with the bar?



- (A) $|-4 - (-1)|$ (B) $-4 + (-1)$ (C) $-4 - (-1)$ (D) $|4 - (-1)|$ (E) None of these

23. Find the distance between a and b . $a = -9.7$, $b = 2$

- (A) -11.7 (B) -7.7 (C) 7.7 (D) 11.7 (E) None of these

24. Find the directed distance from a to b .

$a = -9.2$, $b = -3.5$

- (A) 5.6 (B) 12.7 (C) -5.7 (D) -12.7 (E) None of these

Objective 3: Define intervals on the real line.

Find the inequality that describes the given interval(s).

25. $(3, 8)$

- (A) $\left| x - 5\frac{1}{2} \right| > 2\frac{1}{2}$ (B) $\left| x - 5\frac{1}{2} \right| < 2\frac{1}{2}$ (C) $\left| x - 2\frac{1}{2} \right| < 5\frac{1}{2}$
 (D) $\left| x + 5\frac{1}{2} \right| \leq 2\frac{1}{2}$ (E) None of these

26. $(-\infty, -3) \cup (4, \infty)$

- (A) $\left| x - \frac{1}{2} \right| > 3\frac{1}{2}$ (B) $\left| x - \frac{1}{2} \right| < 3\frac{1}{2}$ (C) $\left| x - 3\frac{1}{2} \right| > \frac{1}{2}$
 (D) $\left| x + \frac{1}{2} \right| \geq 3\frac{1}{2}$ (E) None of these

27. \square All numbers less than $4\frac{1}{2}$ units from -7 .

- (A) $|x + 7| < 4\frac{1}{2}$ (B) $|x - 7| \leq 4\frac{1}{2}$ (C) $|x - 7| < 4\frac{1}{2}$
 (D) $\left| x - 4\frac{1}{2} \right| < 7$ (E) None of these

28. \square r is less than q units from -9 .

- (A) $|r - 9| \leq q$ (B) $|r - 9| < q$ (C) $|q + 9| < r$ (D) $|q + 9| \leq r$ (E) None of these

Objective 4: Find the midpoint of an interval and use intervals to model and solve real-life problems.

29. A computerized manufacturing process is controlled by a program that uses the inequality

$$|t - 140| < 20$$

to keep the temperature of the water used in the process acceptably close to the desired temperature t , in degrees Fahrenheit. What is the range of acceptable temperatures for the water?

- (A) $120^\circ\text{F} < t$ or $t \leq 160^\circ\text{F}$ (B) $t \leq 160^\circ\text{F}$ (C) $120^\circ\text{F} < t < 160^\circ\text{F}$
 (D) $120^\circ\text{F} \leq t \leq 160^\circ\text{F}$ (E) None of these

30. Mr. Williams sells jumbo-size bags of peanut butter chocolate chunk cookies. The number of cookies in each bag must not differ from 100 by more than 7 cookies. Find an inequality which describes b , the acceptable number of cookies in each bag.

(A) $|b - 7| \leq 100$ (B) $|100 - 7| \leq b$ (C) $|7 - b| \leq 100$
 (D) $|100 - b| \leq 7$ (E) None of these

31. For a cupboard door to meet specifications at a carpentry shop, the width must be within $\frac{1}{8}$ inch of the expected width of the door. Find an inequality that expresses the range of acceptable widths for doors that are 2 feet wide, and find the minimum acceptable width of those doors.

(A) $|x + 24| \leq \frac{1}{8}; 24\frac{1}{8}$ in. (B) $|x + \frac{1}{8}| \leq 2; 23\frac{7}{8}$ in. (C) $|x - 2| \leq \frac{1}{8}; 24\frac{1}{8}$ in.
 (D) $|x + \frac{1}{8}| \leq 24; 23\frac{7}{8}$ in. (E) None of these

32. Find the midpoint of the given interval.

$[2, 7]$

(A) -2.5 (B) 4.5 (C) 2.5 (D) -4.5 (E) None of these

Section 0.3: Exponents and Radicals

Objective 1: Evaluate expressions involving exponents and radicals.

33. Evaluate $\frac{3x^3}{4}$ when $x = -2$.

(A) $-\frac{1}{6}$ (B) 6 (C) -54 (D) $-\frac{9}{2}$ (E) None of these

34. Evaluate $\frac{4x^2 + 2x^3}{x^3}$ when $x = 3$.

(A) $\frac{1}{38}$ (B) $\frac{3}{10}$ (C) 38 (D) $\frac{10}{3}$ (E) None of these

35. Find the value of $\frac{x^{5/4}}{2}$ when $x = 81$.

(A) $\frac{729}{2}$ (B) $\frac{243}{2}$ (C) $\frac{2}{243}$ (D) $\frac{81}{2}$ (E) None of these

36. Find the value of $\sqrt{\frac{4}{x^{-3}}}$ when $x = 9$.

- (A) 162 (B) 54 (C) 18 (D) $\frac{1}{54}$ (E) None of these

Objective 2: Simplify expressions with exponents.

Simplify the expression.

37. $\left(\frac{16xy^5}{4x^5y}\right)^4$

- (A) $\frac{4y^{16}}{x^{16}}$ (B) $\frac{256y^8}{x^8}$ (C) $\frac{256y^{16}}{x^{16}}$ (D) $\frac{4y^8}{x^8}$ (E) None of these

38. $\frac{45x^8}{15x^{-7}}$

- (A) $3x^{15}$ (B) $3x$ (C) $\frac{3}{x^{15}}$ (D) $\frac{3}{x}$ (E) None of these

39. $\sqrt{125x^9y^{10}}$

- (A) $\sqrt{5x}$ (B) $5\sqrt{5x^9y^{10}}$ (C) $5x^4|y|^5\sqrt{5x}$ (D) $\sqrt{125x^9y^{10}}$ (E) None of these

40. $\sqrt{9(3x+4)^7}$

- (A) $3(3x+4)^3\sqrt{3(3x+4)}$ (B) $3(3x+4)^3\sqrt{3(3x+4)^3}$ (C) $(3x+4)^3\sqrt{3(3x+4)}$
 (D) $3(3x+4)^3\sqrt{(3x+4)}$ (E) None of these

Objective 3: Find the domains of algebraic expressions.

Find the domain of the given expression.

41. $\sqrt{4-3x}$

- (A) $\left[-\infty, -\frac{4}{3}\right]$ (B) $\left[-\infty, \frac{4}{3}\right]$ (C) $\left[\frac{3}{4}, \infty\right)$ (D) $\left[\frac{4}{3}, \infty\right)$ (E) None of these

Find the domain of the given expression.

42. $\frac{7x^2}{\sqrt{4x-6}} + 6x$

- (A) $\left[\frac{2}{3}, \infty\right)$ (B) $\left(-\infty, \frac{3}{2}\right)$ (C) $\left(\frac{3}{2}, \infty\right)$ (D) $\left(-\infty, \frac{2}{3}\right)$ (E) None of these

43. $\sqrt{x^2 - 11}$

- (A) $(-\infty, -11] \cup [11, \infty)$ (B) $[\sqrt{11}, \infty)$ (C) $(-\sqrt{11}, \sqrt{11})$
 (D) $(-\infty, -\sqrt{11}] \cup [\sqrt{11}, \infty)$ (E) None of these

44. $\sqrt{6-x} - \sqrt{5x-1}$

- (A) $(-\infty, \infty)$ (B) $\left(-\infty, \frac{1}{5}\right] \cup [6, \infty)$ (C) $\left[-6, \frac{1}{5}\right]$ (D) $\left[\frac{1}{5}, 6\right]$ (E) None of these

Section 0.4: Factoring Polynomials

Objective 1: Use special products and factorization techniques to factor polynomials.

Find the complete factorization of the polynomial.

45. $24x^2 + 22x + 3$

- (A) $(6x+1)(4x+3)$ (B) $(6x-1)(4x+3)$ (C) $(6x-1)(4x-3)$
 (D) $(6x+1)(4x-3)$ (E) None of these

46. $49x^2 - 4y^2$

- (A) $(7x+2)(7x-2)$ (B) $(7x+2y)^2$ (C) $(7x+2y)(7x-2y)$
 (D) $(7x-2y)^2$ (E) None of these

47. $16x^3 - 12x^2 - 4x + 3$

- (A) $(2x+1)(2x-1)(4x+3)$ (B) $x(16x^2 - 12x - 4x) + 3$ (C) $(2x+1)^2(4x-3)$
 (D) $4x^2(4x-3) + (-4x+3)$ (E) None of these

Find the complete factorization of the polynomial.

48. $w^3 + 8$

- (A) $(w+2)^3$ (B) $(w+2)(w^2+4)$ (C) $(w+2)(w^2-2w+4)$
 (D) $(w-2)(w^2+2w+4)$ (E) None of these

49. $(3d-6)^2 - w^2$

- (A) $3d(3d-12) - (-6+w)(-6-w)$ (B) $(3d+6+w)(3d+6-w)$
 (C) $(3d+6+w)(3d-6-w)$ (D) $3d(3d-12) + (-6+w)(-6-w)$ (E) None of these

Objective 2: Find the domains of radical expressions.

Find the interval (or intervals) on which the given expression is defined.

50. $\sqrt{x^2 + 7x + 12}$

- (A) $(-\infty, \infty)$ (B) $(-\infty, -4] \cup [-3, \infty)$ (C) $[-4, -3]$
 (D) $(-\infty, 3] \cup [4, \infty)$ (E) None of these

51. $\sqrt{x^2 + 11x + 30}$

- (A) $(-\infty, \infty)$ (B) $[-6, -5]$ (C) $(-\infty, -6] \cup [-5, \infty)$
 (D) $(-\infty, 5] \cup [6, \infty)$ (E) None of these

52. Find the domain of the given expression.

$$\sqrt{-x^2 + 7x - 10}$$

- (A) $(-\infty, \infty)$ (B) $[2, 5]$ (C) $[-5, -2]$ (D) $(-\infty, 2] \cup [5, \infty)$ (E) None of these

53. Find the interval (or intervals) on which the given expression is defined.

$$\sqrt{6-x^2}$$

- (A) $(-\infty, -\sqrt{6}] \cup [\sqrt{6}, \infty)$ (B) $[-\sqrt{6}, \sqrt{6}]$
 (C) $(-\infty, -6] \cup [6, \infty)$ (D) $(-\sqrt{6}, \sqrt{6})$ (E) None of these

Objective 3: Use synthetic division to factor polynomials of degree three or higher.

Use synthetic division to complete the indicated factorization.

54. $x^4 - 4x^3 - 47x^2 + 102x + 144 = (x - 3)(\quad)$
 (A) $x^3 - x^2 + 50x - 48$ (B) $x^3 - 7x^2 + 50x - 48$ (C) $x^3 - 7x^2 - 50x - 48$
 (D) $x^3 - x^2 - 50x - 48$ (E) None of these
55. $x^4 + 2x^3 - 27x^2 - 56x + 80 = (x - 1)(\quad)$
 (A) $x^3 - 3x^2 + 24x - 80$ (B) $x^3 + 3x^2 - 24x - 80$ (C) $x^3 + 3x^2 - 23x - 80$
 (D) $x^3 + 4x^2 - 23x - 80$ (E) None of these
56. $x^4 - 3x^3 - 14x^2 + 48x - 32 = (x - 2)(x - 1)(\quad)$
 (A) $x^2 - x - 17$ (B) $x^2 + 16$ (C) $x^2 - 17$ (D) $x^2 - 16$ (E) None of these
57. $x^3 + 6x^2 - 32 = (x - 2)(\quad)$
 (A) $x^2 + 8x + 15$ (B) $x^2 - 8x - 16$ (C) $x^2 + 9x + 15$
 (D) $x^2 + 8x + 16$ (E) None of these

Objective 4: Use the Rational Zero Theorem to find the real zeros of polynomials.

58. Use the Rational Zero Theorem to determine all possible rational zeros of the polynomial. Do not find the actual zeros.
 $3x^3 - 5x^2 + 3x - 3$
 (A) $\pm 1, \pm 3, \pm \frac{1}{3}$ (B) $\pm 3, \pm 9, \pm \frac{1}{3}$ (C) $0, \pm 1, \pm \frac{1}{3}$
 (D) $\pm 3, \pm \frac{1}{3}, \pm \frac{7}{3}$ (E) None of these
59. Use the Rational Zero Theorem to determine which is not a possible rational zero of the polynomial. Do not find the actual zeros.
 $3x^3 - 6x^2 - 4x - 6$
 (A) 6 (B) $-\frac{1}{3}$ (C) 2 (D) $\frac{4}{3}$ (E) None of these

65. Add and find the simplified expression.

$$\frac{x+5}{x^2+4x+3} + \frac{x-6}{x^2-1}$$

- (A) $\frac{2x^2+3x-23}{(x+1)(x-1)(x+3)}$ (B) $\frac{2x^2+x-23}{(x+1)(x-1)(x+3)}$ (C) $\frac{2x^2+3x-13}{(x+1)(x-1)(x+3)}$
 (D) $\frac{2x^2+x-13}{(x+1)(x-1)(x+3)}$ (E) None of these

Objective 2: Simplify rational expressions involving radicals.

66. Add and simplify.

$$\frac{3\sqrt{x+2}}{x} + \frac{2}{\sqrt{x+2}}$$

- (A) $\frac{5x+6}{x\sqrt{x+2}}$ (B) $\frac{x-6}{\sqrt{x^2+2x}}$ (C) $\frac{3x+8}{x\sqrt{x+2}}$ (D) $\frac{5x+6}{x^2+2}$ (E) None of these

67. Subtract and simplify.

$$\frac{-4x}{(x-1)^{3/2}} - \frac{1}{(x-1)^{1/2}}$$

- (A) $\frac{-3x+1}{(x-1)^{3/2}}$ (B) $\frac{-5x+1}{(x-1)^{3/2}}$ (C) $\frac{-5x+1}{(x-1)^2}$ (D) $\frac{(-4x-1)\sqrt{x-1}}{(x-1)^2}$ (E) None of these

Perform the indicated operations and simplify.

68. $\sqrt{x^3+2} + \frac{x^3}{\sqrt{x^3+2}} \div (x^3+2)$

- (A) $\frac{x^6+5x^3+4}{(x^3+2)^{3/2}}$ (B) $\frac{x^6+1}{(x^3+2)^{3/2}}$ (C) $\frac{x^6+5x^3+4}{(x+2)^2}$
 (D) $\frac{-1}{(x^3+2)^2}$ (E) None of these

Perform the indicated operations and simplify.

69.
$$\frac{\frac{\sqrt{x-1}}{\sqrt{x}} + \frac{\sqrt{x}}{\sqrt{x-1}}}{2(x-1)}$$

(A) $\frac{x-1}{(x^2-1)^{3/2}}$

(B) $-\frac{1}{2\sqrt{x}(x-1)^{3/2}}$

(C) $\frac{x-1}{2\sqrt{x}(x-1)^{3/2}}$

(D) $-\frac{1}{(x^2-1)^{3/2}}$

(E) None of these

Objective 3: Rationalize numerators and denominators of rational expressions.

Rationalize the numerator or denominator and find the simplified result.

70. $\frac{3}{\sqrt{2}}$

(A) $\frac{2\sqrt{2}}{3}$

(B) $\frac{\sqrt{3}}{2}$

(C) $3\sqrt{2}$

(D) $\frac{3\sqrt{2}}{4}$

(E) None of these

71. $\frac{5-\sqrt{5}}{5}$

(A) $\frac{4}{5+\sqrt{5}}$

(B) $\frac{5\sqrt{5}}{5\sqrt{5}-5}$

(C) $\frac{25+\sqrt{5}}{20}$

(D) $\frac{5}{6}$

(E) None of these

72. $\frac{\sqrt{x}+\sqrt{11}}{\sqrt{x}}$

(A) $\frac{x-11}{x-\sqrt{11}x}$

(B) $\frac{11}{\sqrt{11}x}$

(C) $\frac{x-11}{x+\sqrt{11}x}$

(D) $\frac{x+11}{x}$

(E) None of these

Rationalize the numerator or denominator and find the simplified result.

73. $\frac{\sqrt{x} + \sqrt{x+5}}{10}$

(A) $-\frac{1}{2\sqrt{x} + 2\sqrt{x+5}}$

(B) $\frac{1}{2\sqrt{x} - 2\sqrt{x-5}}$

(C) $\frac{1}{2\sqrt{x} - 2\sqrt{x+5}}$

(D) $\frac{1}{2\sqrt{x} + 2\sqrt{x+5}}$

(E) None of these

