

Work-out Problems

Study tip: Show all your work!

Exercise 1. Find each of the following for the given rational function f :

$$f(x) = \frac{2x^2 - 3x - 9}{x^2 - x - 6} .$$

1. The domain

2. The coordinates of all hole(s)

3. The vertical asymptote(s)

$$f(x) = \frac{2x^2 - 3x - 9}{x^2 - x - 6}$$

4. The x -intercept(s)

5. The y -intercept

Exercise 2. Simplify the rational expressions:

1. $\frac{-3}{x+1} - 4\left(\frac{x}{x-6}\right)$

2. $(-7) \cdot \frac{\frac{2}{5} + \frac{3}{b}}{\frac{6}{b} - \frac{3}{a^2}}$

3.
$$\frac{\frac{4 - 2(x + h)}{3(x + h) - 1} - \frac{4 - 2x}{3x - 1}}{h}$$

Exercise 3. Find and completely simplify the difference quotient for $f(x) = \frac{4x}{x-5}$.

Exercise 4. Find and completely simplify the difference quotient for $g(x) = (9 - 5x)^{\frac{1}{2}}$.

Exercise 5. Rationalize the denominator: $\frac{\sqrt{x}}{3\sqrt{x} + \sqrt{x-2}}$

Exercise 6. Write the domain of each algebraic function in interval notation.

1. $f(x) = \frac{12x + 4}{-6x + 72}$

2. $g(s) = \sqrt{15 - 5s}$

3. $h(x) = (87x + 16)^{\frac{1}{3}}$

4. $j(t) = \sqrt{5}t^{14} - \frac{2}{3}$

$$5. \ k(x) = \frac{x+5}{\sqrt[7]{4x-16}}$$

$$6. \ m(x) = \frac{\sqrt[8]{x+3} - \sqrt[3]{4x+15} - 4x + 20}{x(x^3 - 5x^2 - 4x + 20)}$$

$$7. \ n(x) = |3x - 4|$$

Exercise 7. Use the given piecewise-defined function to find the following.

$$f(x) = \begin{cases} \frac{5x-7}{9x^2-9} & \text{if } x < 0 \\ \sqrt[8]{5x+9} & \text{if } 0 \leq x \leq 2 \\ 2x^5 + \sqrt[3]{3x-20} & \text{if } x > 4 \end{cases}$$

1. The domain of f

$$f(x) = \begin{cases} \frac{5x-7}{9x^2-9} & \text{if } x < 0 \\ \sqrt[8]{5x+9} & \text{if } 0 \leq x \leq 2 \\ 2x^5 + \sqrt[3]{3x-20} & \text{if } x > 4 \end{cases}$$

2. The y -intercept

3. $f(-1)$

4. $f(2)$

5. $f(3)$

6. $f(5)$

Exercise 8. A T-shirt printer sells custom-printed shirts for \$12.50 each for the first 20 shirts, and drops the price to \$11.00 for each additional shirt, up to a maximum order of 50 shirts. Let the function $p(s)$ represent the price (in dollars) of ordering s shirts.

1. Write a piecewise-defined function to model $p(s)$.

2. Find and interpret $p(14)$.

3. Solve $p(s) = 569$ for s and interpret your answer.

Exercise 9. Simplify completely

$$\sqrt[5]{\frac{32y^7}{x^{20}}} \div \frac{\left(\sqrt[2]{121x^{\frac{9}{7}}}\right)^3}{y^{-\frac{2}{3}}}$$

Multiple Choice Problems

Study tip: Write out all your work when you complete the multiple-choice problems.

Multiple Choice 1. Simplify the following and express the answer using no negative exponents:

$$\frac{a^{-4}b^7}{(2a^4b^{-1}c^{-2})^5}$$

(a) $\frac{b^{12}c^{10}}{2a^{24}}$

(b) $\frac{b^3}{32a^{13}c^3}$

(c) $\frac{b^{12}c^{10}}{32a^{24}}$

(d) $\frac{a^{-4}b^7}{10a^{20}b^{-5}c^{-10}}$

(e) None of the given answer choices are correct.

Multiple Choice 2. Find the domain of

$$f(x) = \frac{\sqrt{x+5}}{(x+8)(x-9)} .$$

(a) $(-\infty, -8) \cup (-8, -5) \cup (-5, 9) \cup (9, \infty)$

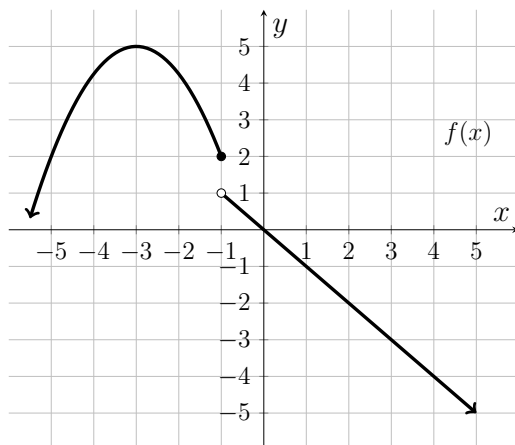
(b) $(0, \infty)$

(c) $(-\infty, -8) \cup (-8, -5] \cup [-5, 9) \cup (9, \infty)$

(d) $(-5, 9) \cup (9, \infty)$

(e) $[-5, 9) \cup (9, \infty)$

Multiple Choice 3. Use the graph of $f(x)$ below to determine which of the following statements is FALSE. (There is only one false statement.)



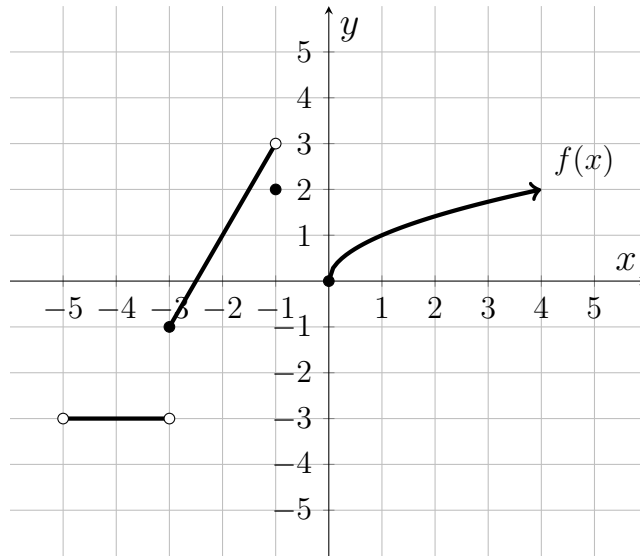
- (a) The domain of $f(x)$ is $(-\infty, \infty)$.
- (b) There is only one value of x for which $f(x) = 1$.
- (c) $f(2) = -2$.
- (d) $f(x)$ does not have a minimum value.
- (e) The range of $f(x)$ is $(-\infty, 1) \cup (2, 5)$.

Multiple Choice 4. Given $H(x)$ below, find $H(8)$.

$$H(x) = \begin{cases} \sqrt{x+8} & \text{if } -7 < x < 0 \\ x^2 - 2x & \text{if } 0 \leq x < 8 \\ |x - 10| & \text{if } 8 \leq x \end{cases}$$

- (a) $H(8) = -2$
- (b) $H(8) = 2$
- (c) $H(8) = 4$
- (d) $H(8) = 48$
- (e) $H(8)$ is undefined.

Multiple Choice 5. Which of the following could be an equation for the piecewise-defined function graphed below?



(a)
$$\begin{cases} -3 & \text{if } -5 < x < -3 \\ 2x + 3 & \text{if } -3 \leq x < -1 \\ 2 & \text{if } x = -1 \\ \sqrt{x} & \text{if } 0 \leq x \end{cases}$$

(b)
$$\begin{cases} -3 & \text{if } -5 < x < -3 \\ 2x + 3 & \text{if } -3 \leq x < -1 \\ 2 & \text{if } x = -1 \\ \sqrt{x} & \text{if } 0 \leq x < 4 \end{cases}$$

(c)
$$\begin{cases} -3 & \text{if } -5 < x \leq -3 \\ 2x + 5 & \text{if } -3 \leq x < -1 \\ -1 & \text{if } x = 2 \\ \sqrt{x} & \text{if } 0 \leq x \end{cases}$$

(d)
$$\begin{cases} -3 & \text{if } -5 < x < -3 \\ 2x + 5 & \text{if } -3 \leq x < -1 \\ 2 & \text{if } x = -1 \\ \sqrt{x} & \text{if } 0 \leq x \end{cases}$$

(e) None of these; this is not the graph of a function.