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)
4. The x-intercept(s)
5. The y-intercept

Exercise 2. Simplify the rational expressions :

1. $\dfrac{-3}{x+1} - 4\left(\dfrac{x}{x-6}\right)$
2. $(-7) \cdot \dfrac{\dfrac{2}{a} + \dfrac{3}{b}}{\dfrac{5}{b} - \dfrac{6}{a^2}}$
3. $\dfrac{\dfrac{4-2(x+h)}{3(x+h)-1} - \dfrac{4-2x}{3x-1}}{h}$

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

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

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

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

1. $f(x) = \dfrac{12x+4}{-6x+72}$
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. $k(x) = \dfrac{x+5}{\sqrt[7]{4x-16}}$
6. $m(x) = \dfrac{\sqrt[8]{x+3} - \sqrt[3]{4x+15} - 4x + 20}{x(x^3 - 5x^2 - 4x + 20)}$
7. $n(x) = |3x-4|$

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

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

1. The domain of f
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) $\dfrac{b^{12}c^{10}}{2a^{24}}$

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

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

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

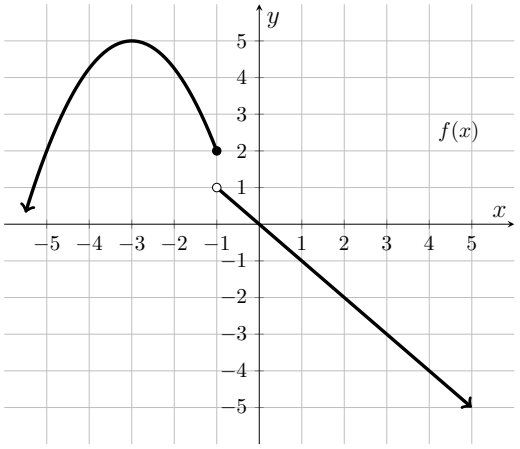
(e) None of the given answer choices are correct.

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.)



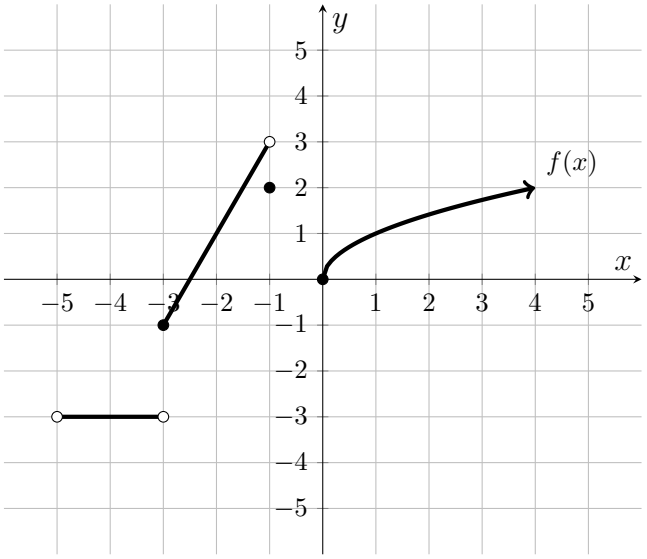
(a) The domain of $f(x)$ is $(-\infty, \infty)$.
(b) There is only one value of x for which $f(x) = 1$.
(c) $f(2) = -2$.
(d) $f(x)$ does not have a minimum value.
(e) The range of $f(x)$ is $(-\infty, 1) \cup (2, 5)$.

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

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

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

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

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

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

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