

$$445. 80a^2 + 120a^3$$

$$\text{Answer: } 40a^2(2 + 3a)$$

$$448. p^2 + pq - 12q^2$$

$$\text{Answer: } (p - 3q)(p + 4q)$$

$$446. 5m(m - 1) + 3(m - 1)$$

$$\text{Answer: } (m - 1)(5m + 3)$$

$$449. xy - 8y + 7x - 56$$

$$\text{Answer: } (x - 8)(y + 7)$$

$$447. x^2 + 13x + 36$$

$$\text{Answer: } (x + 7)(x + 6)$$

$$450. 40r^2 + 810$$

$$\text{Answer: } 10(4r^2 + 81)$$

$$451. 9s^2 - 12s + 4$$

$$\text{Answer: } (3s - 2)^2$$

$$454. 6u^2 + 3u - 18$$

$$\text{Answer: } 3(2u - 3)(u + 2)$$

$$452. 6x^2 - 11x - 10$$

$$\text{Answer: } (2x - 5)(3x + 2)$$

$$455. x^3 + 125$$

$$\text{Answer: } (x + 5)(x^2 - 5x + 25)$$

$$453. 3x^2 - 75y^2$$

$$\text{Answer: } 3(x + 5y)(x - 5y)$$

$$456. 32x^5y^2 - 162xy^2$$

$$\text{Answer: } 2xy^2(4x^2 + 9)(2x - 3)(2x + 3)$$

457.  $6x^4 - 19x^2 + 15$

**Answer:**  $(3x^2 - 5)(2x^2 - 3)$

458.  $3x^3 - 36x^2 + 108x$

**Answer:**  $3x(x-6)^2$

In the following exercises, solve

459.  $5a^2 + 26a = 24$

**Answer:**  $a = 4/5, a = -6$

460. The product of two consecutive integers is 156. Find the integers.

**Answer:** 12 and 13; -13 and -12

461. The area of a rectangular place mat is 168 square inches. The length is 4 inches more than the width. Find the length and width of the placemat.

**Answer:** The width is 12 inches and the length is 14 inches.

462. Jing is going to throw a ball from the balcony of her condo. If the ball is launched 80 feet above the ground, the function  $h(t) = -16t^2 + 64t + 80$  gives the height of the ball above the ground as a function of time,  $t$ . Find: (a) the zero of the function (b) when the ball will hit the ground. (c) the time (s) the ball will be at the height the ball will be at  $t = 4$  seconds.

**Answer:** (a)  $t = 5$  (b)  $t = 1, t = 3$  (c) 80 ft.

463. For the function,  $f(x) = x^2 - 7x + 5$ , (a) find when  $f(x) = -7$  (b) find two points that lie on the graph of the function.

**Answer:** (a)  $x = 3$  or  $x = 4$  (b)  $(3, -7)$   $(4, -7)$

464. For the function  $f(x) = 25x^2 - 81$ , find: (a) the zeros of the function (b) the graph of the function (c) the y-intercept of the graph of the function

**Answer:** (a)  $x = \frac{9}{5}$  or  $x = -\frac{9}{5}$  (b)  $\left(\frac{9}{5}, 0\right), \left(-\frac{9}{5}, 0\right)$  (c)  $(0, -81)$

$$\text{Answer: } -\frac{a}{a+4}$$

$$489. \frac{2n^2+8n-1}{n^2-1} - \frac{n^2-7n-1}{1-n^2}$$

$$\text{Answer: } \frac{3n-2}{n-1}$$

$$483. \frac{4a^2b}{12ab^2}$$

$$\text{Answer: } \frac{a}{3b}$$

$$484. \frac{6x-18}{x^2-9}$$

$$\text{Answer: } \frac{6}{x+3}$$

In the following exercises, perform t

$$485. \frac{4x}{x+2} \cdot \frac{x^2+5x+6}{12x^2}$$

$$\text{Answer: } \frac{x+3}{3x}$$

$$486. \frac{2y^2}{y^2-1} \div \frac{y^3-y^2+y}{y^3-1}$$

$$\text{Answer: } \frac{2y}{y-1}$$

$$487. \frac{6x^2-x+20}{x^2-81} - \frac{5x^2+11x-7}{x^2-81}$$

$$\text{Answer: } \frac{x-3}{x+9}$$

$$495. \frac{6x}{x-6} \leq 2$$

$$\text{Answer: } [-3, 6)$$

$$491. \frac{\frac{1}{m} - \frac{1}{n}}{\frac{1}{n} + \frac{1}{m}}$$

$$\text{Answer: } \frac{n-m}{m+n}$$

In the following exercises, solve each

$$492. \frac{1}{x} + \frac{3}{4} = \frac{5}{8}$$

$$\text{Answer: } x = -8$$

$$493. \frac{1}{z-5} + \frac{1}{z+5} = \frac{1}{z^2-25}$$

$$\text{Answer: } z = \frac{1}{2}$$

$$494. \frac{z}{2z+8} - \frac{3}{4z-8} = \frac{3z^2-16z-16}{8z^2+2z-64}$$

$$\text{Answer: } \text{There is no solution.}$$

$$496. \frac{2x+3}{x-6} > 1$$

**Answer:**  $(-\infty, -9) \cup (6, \infty)$

$$497. \frac{1}{2} + \frac{12}{x^2} \geq \frac{5}{x}$$

**Answer:**  $(-\infty, 0) \cup (0, 4] \cup [6, \infty)$

In the following exercises, find  $R(x)$ .

$$498. R(x) = f(x) - g(x)$$

$$\text{Answer: } R(x) = \frac{2x-9}{(x+2)(x-5)(x-4)}$$

$$499. R(x) = f(x) \cdot g(x)$$

$$\text{Answer: } R(x) = \frac{1}{(x+2)(x+2)}$$

**Answer:** Matheus' speed on his bike is 14 mph.

$$500. R(x) = f(x) \div g(x)$$

$$\text{Answer: } R(x) = \frac{(x-4)^2}{(x-5)^2}$$

505. Oliver can split a truckload of logs in 8 hours, but working with his dad in 3 hours. How long would it take Oliver's dad working alone to split the logs?

**Answer:** Oliver's dad would take  $4\frac{4}{5}$  hours to split the logs himself.

501. Given the function,  $R(x) = \frac{2x-9}{2x^2+5x-12}$ , find the domain of  $R(x)$  where  $x$  is greater than or equal to 0.

**Answer:**  $(2, 5]$

506. The volume of a gas in a container varies inversely with the pressure. A container of nitrogen has a volume of 29.5 liters with 2000 psi, what volume would it have with a 14.7 psi rating? Round to the nearest whole number.

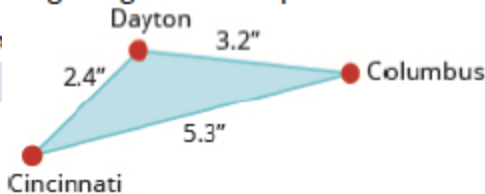
**Answer:** The volume is about 4014 liters.

In the following exercises, solve.

502. If  $y$  varies directly with  $x$ , and  $y = 14$  when  $x = 2$ , find  $x$  when  $y = 7$ .

**Answer:**  $x = 7$

507. The cities of Dayton, Columbus, and Cincinnati form a triangle in Ohio. A diagram gives the map distances between these cities in inches.



503. If  $y$  varies inversely with the square of  $x$ , and  $y = 16$  when  $x = 3$ , find  $y$  when  $x = 9$ .

$$\text{Answer: } y = \frac{81}{16}$$

The actual distance from Dayton to Cincinnati is 48 miles. What is the actual distance between Dayton and Columbus?

**Answer:** The distance between Dayton and Columbus is 64 miles.

In the following exercises, simplify using absolute values as necessary.

$$579. \sqrt[3]{125x^9}$$

$$\text{Answer: } 5x^3$$

$$580. \sqrt{169x^8y^6}$$

$$\text{Answer: } 13x^4y^3$$

$$581. \sqrt[3]{72x^8y^4}$$

$$\text{Answer: } 2x^2y \sqrt[3]{9x^2y}$$

$$582. \sqrt{\frac{45x^3y^4}{180x^5y^2}}$$

$$\text{Answer: } \frac{|y|}{2|x|}$$

In the following exercises,

$$583. (a) 216^{\frac{1}{4}} \quad (b) -49^{\frac{3}{2}}$$

$$\text{Answer: } (a) \frac{1}{4} \quad (b) -343$$

$$584. \sqrt{-45}$$

$$\text{Answer: } 3\sqrt{5}i$$

$$585. \frac{x^{\frac{1}{4}} \cdot x^{\frac{5}{4}}}{x^{\frac{3}{4}}}$$

$$\text{Answer: } x^{\frac{7}{4}}$$

$$586. \left( \frac{8x^{\frac{2}{3}}y^{-\frac{5}{2}}}{x^{\frac{7}{3}}y^{\frac{1}{2}}} \right)^{\frac{1}{3}}$$

$$\text{Answer: } \frac{2x}{y}$$

$$587. \sqrt{48x^5} - \sqrt{75x^5}$$

$$\text{Answer: } -x^2\sqrt{3x}$$

$$588. \sqrt{27x^2} - 4x\sqrt{12} + \sqrt{108}$$

$$\text{Answer: } x\sqrt{3}$$

$$589. 2\sqrt{12x^5} \cdot 3\sqrt{6x^3}$$

$$\text{Answer: } 36x^4\sqrt{2}$$

$$590. \sqrt[3]{4}(\sqrt[3]{16} - \sqrt[3]{6})$$

$$\text{Answer: } 4 + 2\sqrt[3]{3}$$

$$591. (4 - 3\sqrt{3})(5 + 2\sqrt{3})$$

$$\text{Answer: } 2 - 7\sqrt{3}$$

$$592. \frac{\sqrt[3]{128}}{\sqrt[3]{54}}$$

$$\text{Answer: } \frac{4}{3}$$

$$593. \frac{\sqrt{245xy^{-4}}}{\sqrt{45x^{-4}y^3}}$$

$$\text{Answer: } \frac{7x^5}{3y^7}$$

$$594. \frac{1}{\sqrt[3]{5}}$$

$$\text{Answer: } \frac{\sqrt[3]{25}}{5}$$

$$595. \frac{3}{2 + \sqrt{3}}$$

$$\text{Answer: } 3(2 - \sqrt{3})$$

$$596. \sqrt{-4} \cdot \sqrt{-9}$$

$$\text{Answer: } -6$$

$$597. -4i(-2 - 3i)$$

$$\text{Answer: } -12 + 8i$$

$$598. \frac{4+i}{3-2i}$$

$$\text{Answer: } \frac{10}{7} + \frac{11}{7}i$$

$$599. i^{172}$$

$$\text{Answer: } -i$$

In the following exercises, solve.

$$600. \sqrt{2x+5} + 8 = 6$$

$$\text{Answer: no real number}$$

$$601. \sqrt{x+5} + 1 = x$$

$$\text{Answer: } x = 4$$

$$602. \sqrt[3]{2x^2 - 6x - 23} = \sqrt[3]{x^2 - 3x + 5}$$

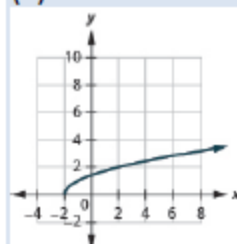
$$\text{Answer: } x = -4, x = 7$$

In the following exercise, (a) find the graph to determine the range.

$$603. g(x) = \sqrt{x+2}$$

$$\text{Answer: (a) domain: } [-2, \infty)$$

(b)



$$(c) \text{ range: } [0, \infty)$$

$$535. 3q^2 - 10q + 12 = 0$$

**Answer:** 2 complex

529. Use the Square Root Pr

**Answer:**  $w = -2, w = -8$

Solve each equation.

$$536. 4x^4 - 17x^2 + 4 = 0$$

**Answer:**  $x = \pm \frac{1}{2}, x = \pm 2$

530. Use Completing the Squ

**Answer:**  $a = 4 \pm 4\sqrt{2}$

$$537. y^{\frac{2}{3}} + 2y^{\frac{1}{3}} - 3 = 0$$

**Answer:**  $y = 1, y = -27$

531. Use the Quadratic Form

**Answer:**  $m = 1, m = \frac{3}{2}$

For each parabola, find (a) which direction it opens, (b) the equation of the axis of symmetry, (c) the vertex, (d) the  $x$ - and  $y$ -intercepts, and e) the maximum or minimum value.

Solve the following quadratic

$$538. y = 3x^2 + 6x + 8$$

**Answer:** (a) up (b)  $x = -1$  (c)  $(-1, 5)$  (d)  $y$ :  $(0, 8)$ ;  $x$ : none (e) minimum value of 5 when  $x = -1$

$$532. 2x(3x - 2) - 1 = 0$$

**Answer:**  $x = \frac{1}{3} \pm \frac{\sqrt{10}}{6}$

$$539. y = -x^2 - 8x + 16$$

**Answer:** (a) down (b)  $x = -4$  (c)  $(-4, 0)$  (d)  $y$ :  $(0, 16)$ ;  $x$ :  $(-4, 0)$  (e) minimum value of  $-4$  when  $x = 0$

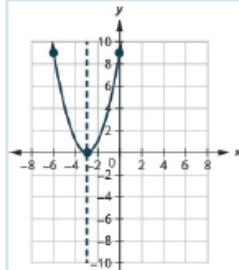
$$533. \frac{9}{4}y^2 - 3y + 1 = 0$$

**Answer:**  $y = \frac{2}{3}$

Graph each quadratic function using intercepts, the vertex, and the equation of the axis of symmetry.

$$540. f(x) = x^2 + 6x + 9$$

**Answer:**



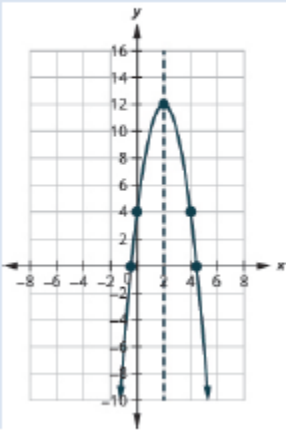
Use the discriminant to determine the number of real solutions of the equation.

$$534. 6p^2 - 13p + 7 = 0$$

**Answer:** 2 real

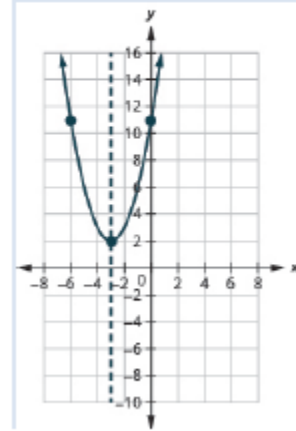
$$541. f(x) = -2x^2 + 8x + 4$$

**Answer:**



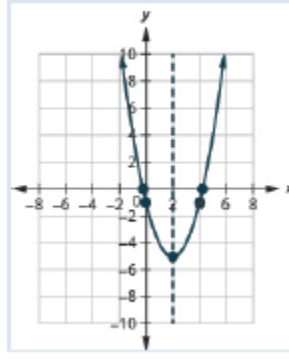
$$542. f(x) = (x + 3)^2 + 2$$

**Answer:**



$$543. f(x) = x^2 - 4x - 1$$

**Answer:**



544.  $x^2 - 6x - 8 \leq 0$

**Answer:**  $[3 - \sqrt{17}, 3 + \sqrt{17}]$

545.  $2x^2 + x - 10 > 0$

**Answer:**  $\left(-\infty, -\frac{5}{2}\right) \cup (2, \infty)$

Model the situation with a quadratic equation and solve by any method.

546. Find two consecutive even numbers whose product is 360.

**Answer:** Two consecutive even numbers are  $-20$  and  $-18$ , and  $18$  and  $20$ .

547. The length of a diagonal of a rectangle is three more than the width. The rectangle is three times the width. Find the length of the diagonal. (Round to the tenth.)

**Answer:** The diagonal is 3.8 units long.

548. A water balloon is launched upward at the rate of 86 ft/sec. Using the for  $86t$  find how long it will take the balloon to reach the maximum height, and the maximum height. Round to the nearest tenth.

**Answer:** In 2.7 seconds, the water balloon is at its highest point of 115.6 feet.

447. For the functions,  $f(x) = 6x + 1$  and  $g(x) = 8x - 3$ , find (a)  $(f \cdot g)(x)$ .

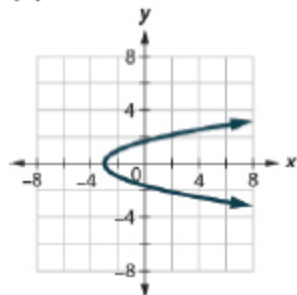
**Answer:** (a)  $48x - 17$  (b)  $48x + 5$  (c)  $48x^2 - 10x - 3$

448. Determine if the following set of ordered pairs represents a function one-to-one.  $\{(-2, 2), (-1, -3), (0, 1), (1, -2), (2, -3)\}$

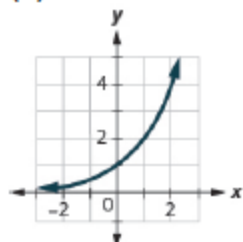
**Answer:** Function; not one-to-one

449. Determine whether each graph is the graph of a function

(a)

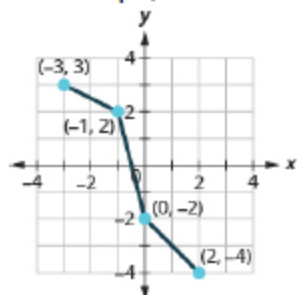


(b)

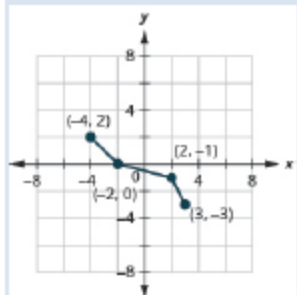


**Answer:** (a) Not a function (b) One-to-one function

450. Graph, on the same coordinate system, the inverse



**Answer:**



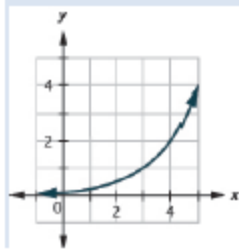
451. Find the inverse of the function  $f(x) = x^5 - 9$ .

**Answer:**  $f^{-1}(x) = \sqrt[5]{x+9}$



452. Graph the function  $g(x) = 2^{x-3}$ .

**Answer:**



453. Solve the equation  $2^{2x-4} = 64$ .

**Answer:**  $x = 5$

454. Solve the equation  $\frac{e^{x^2}}{e^4} = e^{3x}$ .

**Answer:**  $x = -1, x = 3$

455. Megan invested \$21,000 in a savings account. If the account earns 5% interest compounded annually (a) compounded annually (b) compounded monthly (c) compounded continuously.

**Answer:** (a) \$31,250.74 (b) \$31,302.29 (c) \$31,328.32

456. Convert the equation from exponential to logarithmic form.

**Answer:**  $\log \frac{1}{100} = -2$

457. Convert the equation from logarithmic equation to exponential form.

**Answer:**  $343 = 7^3$

458. Solve for  $x$ :  $\log_5 x = -3$

**Answer:**  $x = \frac{1}{125}$

459. Evaluate  $\log_{11} 1$ .

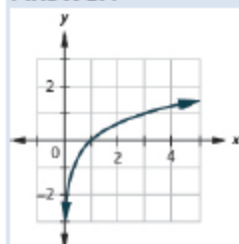
**Answer:** 0

460. Evaluate  $\log_4 \frac{1}{64}$ .

**Answer:** -3

461. Graph the function  $y = \log_3 x$ .

**Answer:**



462. Solve for  $x$ :  $\log(x^2 - 39) = 1$

**Answer:**  $x = -7, x = 7$

463. What is the decibel level of a small fan with intensit

**Answer:** 40 dB

464. Evaluate each. (a)  $6^{\log_6 17}$  (b)  $\log_9 9^{-3}$

**Answer:** (a) 17 (b) -3

In the following exercises, use properties of logarithms t  
logarithms, simplifying if possible.

465.  $\log_5 25ab$

**Answer:**  $2 + \log_5 a + \log_5 b$

466.  $\ln \frac{e^{12}}{8}$

**Answer:**  $12 - \ln 8$

467.  $\log_2 \sqrt[4]{\frac{5x^3}{16y^2z^7}}$

**Answer:**  $\frac{1}{4}(\log_2 5 + 3\log_2 x - 4 - 2\log_2 y - 7\log_2 z)$

In the following exercises, use the Properties of Logarith  
simplifying if possible.

468.  $5\log_4 x + 3\log_4 y$

**Answer:**  $\log_4 x^5 y^3$

469.  $\frac{1}{6} \log x - 3 \log(x+5)$

**Answer:**  $\log \frac{\sqrt[6]{x}}{(x+5)^3}$

470. Rounding to three decimal place

**Answer:** 3.095

471. Solve for  $x$ :  $\log_7(x+2) + \log_7(x$

**Answer:**  $x = 6$

In the following exercises, solve each  
approximate it to three decimal place

472.  $\left(\frac{1}{5}\right)^x = 9$

**Answer:**  $x = \frac{\log 9}{\log \frac{1}{5}} \approx -1.365$

473.  $5e^{x-4} = 40$

**Answer:**  $x = \ln 8 + 4 \approx 6.079$

474. Jacob invests \$14,000 in an acco  
How long will it take for his money to

**Answer:** 17.4 years

475. Researchers recorded that a cer  
At this rate of growth, how many bac

**Answer:** 1,921 bacteria

476. A certain beetle population can  
that beetle population to triple?

**Answer:** 4.75 months