

1. Evaluate each of the following expressions.

a. $10 + 5^0 - 3(5 + (-2)^2)$

b. $\frac{5}{3+4} \div (3+7) + \frac{2}{3}$

c. $5 \times \left| \frac{1}{2} - \frac{11}{3} \right| - \left| \frac{3}{5+3} \right|$

2. Simplify each of the following.

a. $(3x + 5)(3x - 5) + \left(x + \frac{1}{5}(10x - 35)\right)^2$

b. $5x^3 + 12x^2 - (x - 3)^3$

3. Solve each equation for x .

a. $2x^2 + 2x(2x - 7) - 10 + 16x = 5 - x + 3(2x^2 + 7) - 12$

b. $\frac{1}{4} \left(\frac{4}{6} - \frac{8}{3}x \right) = \frac{1}{5}x - \frac{7}{2}$

4. Simplify each of the following expressions and express the result without using negative exponents. Assume that each variable is not zero.

a. $(15x^3y^4)^2 \cdot \frac{(35x^2z^{-3})^{-3}}{y}$

b. $\left(\frac{7a^3b^4}{3a^2b^3c^{-2}} \right)^2 \cdot \frac{3ab}{b^0} \cdot c^2$

5. Factor each polynomial completely.

a. $x^4 - 5x^2 - 24$

b. $5z^5 + 40z^2y^6$

6. Solve each equation by factoring.

a. $3x^2 - 14x = 5$

b. $3x^2 - 5x + 10 = 70 - 2x$

c. $x^3 + 23 = 5x^2 + 4x + 3$

7. Simplify each of the following expressions. Assume that $x, y, z > 0$.

a. $x^2y^{-1}\sqrt{32x^5y^4z^6}$

b. $\frac{-4\sqrt{72x^2y^3z^6}}{y\sqrt{18x^5y^3z}}$

c. $\sqrt{28} - 3\sqrt{125} + 10\sqrt{63} - 4\sqrt{45} + \sqrt{50}$

d. $(5\sqrt{11} + 2\sqrt{3})(\sqrt{11} - 5\sqrt{3})$

8. Rationalize the denominator of each expression and simplify the result.

a. $\frac{7\sqrt{6}}{\sqrt{10}}$

b. $\frac{6\sqrt{3}}{\sqrt{30} + 2\sqrt{7}}$

9. Solve the equation $\sqrt{2x^2 - 7} + x = 3$ for x , or show that the equation has no solutions.

10. By *taking square roots*, find all solutions of the equation $\frac{2}{3}(x + 3)^2 + 20 = -16$.

11. By *completing the square*, find all solutions of the equation $x^2 - 10 = 3x$.

12. Use *the Quadratic Formula* to find all solutions of the equation $-9x^2 + 6x - 1 = 0$.

13. The company Real Exams gave a 42% discount on algebra exams, and the instructors bought this exam for \$87. What was the original cost of this exam?

(*Hint*: Sale Price = Original Price – Discount Rate \times Original Price.)

14. If a box of secret math supplies has an area of twenty-four square metres and is two metres longer than it is wide, what are the dimensions of the box?

15. Solve the following linear system *by substitution*.

$$3x + 5y = 4$$

$$2x - 4y = 10$$

16. Solve the following system *by elimination*.

$$2x + 3y = 21$$

$$-3x - 4y = -31$$

17. Consider the line L with the equation $3x - y = 15$.

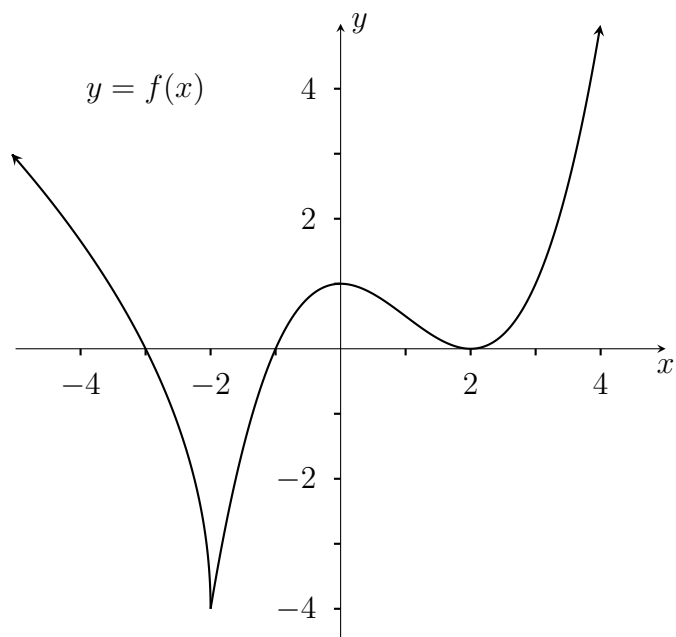
a. Find the x -intercept of L and the y -intercept of L .

b. Find the slope of L .

c. Sketch the graph of L .

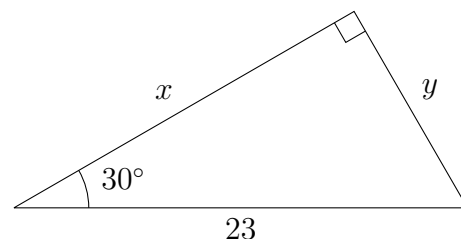
d. Are L and $y = 3x + 3$ parallel, perpendicular or neither? Explain your answer.

18. a. Find the distance between the points $(6, 3)$ and $(4, -5)$.
b. Find the midpoint of the line segment between the points $(6, 3)$ and $(4, -5)$.
c. Give an equation of:
i. the line that passes through $(6, 3)$ and $(4, -5)$;
ii. the line that passes through $(6, 3)$ and is perpendicular to $y = 3x + 10$;
iii. the line that passes through $(4, -5)$ and is parallel to $y = -5x$.
iv. the line passes through $(6, 3)$ and is perpendicular to $y = 2$.
19. Give the domain, range, intercepts, sign (where f is positive/negative) and extrema (local max/min) of the function f whose graph is displayed below.



20. Let $f(x) = -x^2 + 5x - 1$.
- Evaluate $f(0)$.
 - Evaluate $f(2)$.
 - Evaluate $f\left(\frac{1}{3}\right)$.
 - For which values of h is $f(2 + h) = f(2) + f(h)$?
21. Given that θ is an acute angle in a right triangle such that $\tan \theta = \frac{8}{3}$, find the exact values of $\sin \theta$, $\cos \theta$, $\cot \theta$, $\sec \theta$ and $\csc \theta$.
22. Given $\csc \theta = \sqrt{2}$, find the acute angle θ .

23. Find the exact values of x and y in the triangle below.



24. Solve each equation for x .

a. $5^{2+x} = 125$

b. $1 = \frac{9^x}{3^5}$

c. $2(e^{2x} + 2) = 7$

Answers

1. a. -16

b. $\frac{31}{42}$

c. $\frac{371}{24}$

2. a. $18x^2 - 42x + 24$

b. $4x^3 + 21x^2 - 27x + 27$

3. a. $x = 8$

b. $x = \frac{55}{13}$

4. a. $\frac{3^2 y^7 z^9}{7^3 5}$

b. $\frac{7^2 a^3 b^3 c^6}{3}$

5. a. $(x^2 - 8)(x^2 + 3)$ OR $(x - 2\sqrt{2})(x + 2\sqrt{2})(x^2 + 3)$

b. $5z^2(z + 2y^2)(z^2 - 2y^2z + 4y^4)$

6. a. $x = \frac{-1}{3}, x = 5$

b. $x = -4, x = 5$

c. $x = -2, x = 2, x = 5$

7. a. $4yz^3\sqrt{2x^9}$

b. $\frac{-8\sqrt{z^5}}{y\sqrt{x^3}}$

c. $32\sqrt{7} - 27\sqrt{5} + 5\sqrt{2}$

d. $25 - 23\sqrt{33}$

8. a. $\frac{7\sqrt{15}}{5}$

b. $9\sqrt{20} - 6\sqrt{21}$

9. $x = -8, x = 2$
10. No solutions
11. $x = 5, x = 2$
12. $x = \frac{1}{3}$
13. Original cost is \$150
14. The box is 4×6
15. $(3, -1)$
16. $(9, 1)$
17. a. x -intercept $(5, 0)$ and y -intercept $(0, -15)$
b. 3
c. Draw a line connecting both intercepts (is the easiest way)
d. Parallel, they have the same slope
18. a. $2\sqrt{17}$
b. $(5, -1)$
c. i. $y = 4x - 21$
ii. $y = \frac{-1}{3}x + 5$
iii. $y = -5x + 15$
iv. $x = 6$
19. Domain: $x \in \mathbb{R}$, Range: $y \in \mathbb{R}, y \geq -4$, Intercepts: $(-3, 0), (-1, 0), (2, 0)$ and $(0, 1)$, Sign: Positive $x < -3, -1 < x < 2, x > 2$ Negative $-3 < x < -1$, Local Extrema: local mins $(-2, -4), (2, 0)$ and local max $(0, 1)$.
20. a. $f(0) = -1$
b. $f(2) = 5$
c. $f(\frac{1}{3}) = \frac{5}{9}$
d. $h = \frac{1}{4}$
21. $\sin \theta = \frac{8\sqrt{73}}{73}, \cos \theta = \frac{3\sqrt{73}}{73}, \tan \theta = \frac{8}{3}, \csc \theta = \frac{\sqrt{73}}{8}, \sec \theta = \frac{\sqrt{73}}{3}, \cot \theta = \frac{3}{8},$
22. $\theta = 45^\circ$
23. $y = \frac{23}{2}$
24. a. $x = 1$
b. $x = \frac{5}{2}$
c. $x = \frac{\ln(\frac{3}{2})}{2}$