

1. (6 points) Evaluate the following expressions.

(a) $(6 - 7)^9 - 5(10 - 4^2) + 21^0 + 12^1$

(b) $\frac{2}{3} - (6 - 8)^3 \div \frac{1 - (-3)}{1 + 3(1^2 - 2)}$

(c) $\frac{1 - 2^2}{2^3 - 3^2} \div \left| \frac{5 - (-2)^2}{1 - 9} \right| + 4$

2. (4 points) Expand and simplify the following expressions.

(a) $(3x + 2)(4 - 6x + 9x^2) - 8$

(b) $4(t - s)^2 - (2t - 3s)(2t + 3s)$

3. (2 points) A bicycle is sold at a 20% discount for \$320. What was the original price of the bicycle? [Recall: Selling Price = Original Price - Original Price · Discount Rate]

4. (2 points) What was the initial sum deposited to my 1.2% chequing account if I gained \$3000 in simple interest over the last two years? [Recall: $I = P \cdot r \cdot t$]

5. (2 points) A waffle machine is sold for \$26 in a store that marks up small kitchen appliances by 30%. What was the original price of the waffle machine? [Recall: Selling Price = Cost + Cost · Markup Rate]

6. (6 points) Solve the following equations.

(a) $\frac{2x + 3}{6} = \frac{x}{3} - 4$

(b) $5(a + 1) - 3(2 - a) = 3 + 2(a + 4) + 3(2a - 3)$

(c) $(t + 8)(t + 1) = (4 + t)(3 + t)$

7. (3 points) Consider the line that passes through the points (1,3) and (5,1).

(a) Find the slope of the line.

(b) Find the equation of the line.

(c) Find the x -intercept of the line.

8. (5 points) Consider the line passing through the point (2,1) and perpendicular to $2x + y = 7$.

(a) Find the equation of the line.

(b) Sketch both lines in the same coordinate system.

9. (3 points) Solve the following linear system **by the method of substitution**.

$$\begin{cases} 3x + 2y = 4 \\ 2x + 5y = 10 \end{cases}$$

10. (3 points) Solve the following linear system **by the method of elimination**.

$$\begin{cases} 4x + 3y = 4 \\ 2x - 6y = -3 \end{cases}$$

11. (4 points) Simplify each of the following expressions. You may assume that all variables are positive.
Present the result without negative exponents.

(a) $(3ab^{-1}c^2)^3 (9a^0b^1c^{-1})^{-1} =$

(b) $\left(\frac{42x^2y^{-4}z^1}{21z^3x^{-2}y^0}\right)^{-2} =$

12. (4 points) Factor each polynomial completely.

(a) $4x^2 + 14x + 6$

(b) $50x^4 - 72y^2$

13. (3 points) Solve the equation $x - \sqrt{2x^2 - 7} = 1$ or show that it has no solutions.

14. (6 points) Solve the following equations for x by factoring.

(a) $x^5 - 1 = 2x - x^3 - 1$

(b) $(3x + 2)(x + 1) = 4$

(c) $2x^3 + 20 = 5x^2 + 8x$

15. (3 points) **By taking square roots**, find all solutions to $2(2x + 1)^2 - 18 = 0$.

16. (3 points) **By completing the square**, find all solutions to $x^2 - 8x + 14 = 0$.

17. (3 points) **By using the Quadratic Formula**, find all solutions to $2x^2 + 5 = 3x$.

18. (8 points) Simplify each of the following expressions. You may assume that all variables are positive.
Present the result without negative exponents.

(a) $\sqrt{75} - 4\sqrt{12} + 3\sqrt{3} + \sqrt{27}$

(b) $(\sqrt{20} - 2\sqrt{3})(2\sqrt{5} + \sqrt{12})$

(c) $\sqrt{18x^7y^6z^1}$

(d) $\sqrt{\frac{12a^{-4}b^2}{27a^4b^{-1}}}$

19. (4 points) Rationalize the denominator of each expression and simplify.

(a) $\frac{6}{2\sqrt{3} - 3}$

(b) $\frac{3 - x}{2 + \sqrt{x - 1}}$

20. (3 points) Evaluate the following logarithms.

(a) $\log_3(81)$

(b) $\ln(e^{-4})$

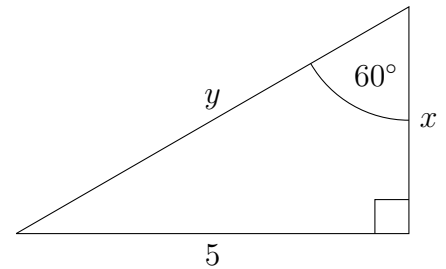
(c) $\log_2\left(\frac{1}{16}\right)$

21. (4 points) Solve each equation for x .

(a) $2^{2x-5} = \frac{1}{8}$

(b) $\frac{1}{4^{x-5}} = 64$

22. (2 points) Find the exact value of x and y in the right triangle below.

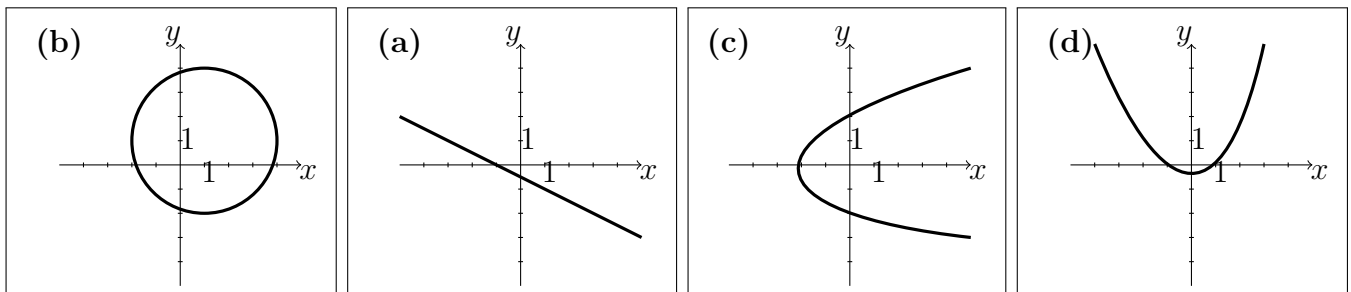


23. (3 points) If $\sec \theta = \frac{3}{\sqrt{5}}$ for the acute angle θ in a right triangle, find the exact values of the other five trigonometric functions.

24. (2 points) Find the midpoint of the line segment joining the points $(5, -2)$ and $(9, 6)$.

25. (2 points) Find the distance between the points $(3, -2)$ and $(2, 2)$.

26. (2 points) Which of the following are graphs of relations for which y is function of x ?



27. (4 points) Given $f(z) = z^3 - 2z + 3$, evaluate and simplify the following expressions.

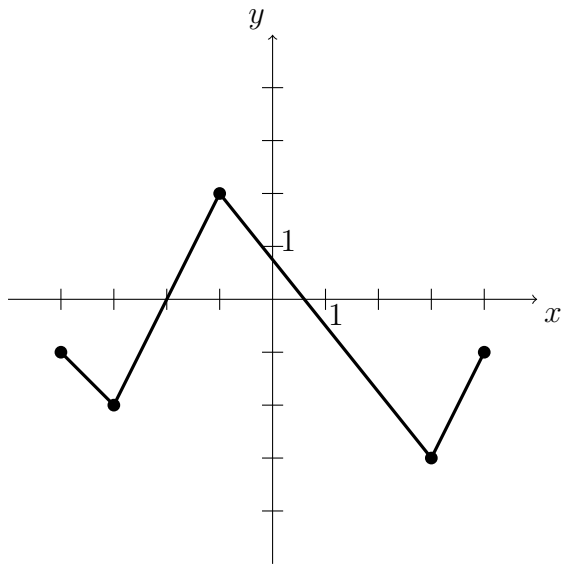
(a) $f(-1)$

(b) $f\left(\frac{3}{2}\right)$

(c) $f(\sqrt{3})$

(d) $f(z + h)$

28. (4 points) Given the graph $y = f(x)$ of a function $f(x)$, find



- the domain of $f(x)$:
- the range of $f(x)$:
- the x -intercepts:
- the y -intercept:
- the intervals where $f(x)$ is positive:
- the intervals where $f(x)$ is negative:
- the local minima of $f(x)$:
- the local maxima of $f(x)$:

Solutions

1.

(a) 42

(b) $-\frac{10}{3}$

(c) 28

2.

(a) $27x^3$

(b) $-8ts + 13s^2$

3. 400\$

4. 125000\$

5. 20\$

6.

(a) no solution

(b) no solution

(c) $t = 2$

7.

(a) $-\frac{1}{2}$

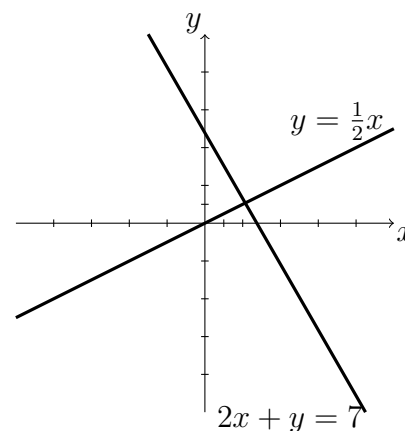
(b) $y = -\frac{1}{2}x + \frac{7}{2}$

(c) (7, 0)

8.

(a) $y = \frac{1}{2}x$

(b)



9.

$x = 0, y = 2$

10.
 $x = \frac{1}{2}, y = \frac{2}{3}$

11.

(a) $\frac{3a^3c^7}{b^4}$

(b) $\frac{y^8z^4}{4x^8}$

12.

(a) $2(2x + 1)(x + 3)$

(b) $2(5x^2 - 6y)(5x^2 + 6y)$

13. $x = 2$ **14.**

(a) $x = -1, x = 0, x = 1$

(b) $x = \frac{1}{3}, x = -2$

(c) $x = -2, x = 2, x = \frac{5}{2}$

15. $x = 1, x = -2$ **16.** $x = 4 + \sqrt{2}, x = 4 - \sqrt{2}$ **17.** no solution (negative discriminant)**18.**

(a) $3\sqrt{3}$

(b) 8

(c) $3x^3y^3\sqrt{2xz}$

(d) $\frac{2b\sqrt{b}}{3a^4}$

19.

(a) $4\sqrt{3} + 6$

(b) $\frac{(3-x)(2-\sqrt{x-1})}{5-x}$

20.

(a) 4

(b) -4

(c) -4

21.

(a) $x = 1$

(b) $x = 2$

22. $x = \frac{5\sqrt{3}}{3}, y = \frac{10\sqrt{3}}{3}$

23.

$\sin \theta = \frac{2}{3}, \cos \theta = \frac{\sqrt{5}}{3}, \tan \theta = \frac{2}{\sqrt{5}}$

$\csc \theta = \frac{3}{2}, \sec \theta = \frac{3}{\sqrt{5}}, \cot \theta = \frac{\sqrt{5}}{2}$

24. (7, 2)**25.** $\sqrt{17}$ **26.** (a), (d)**27.**

(a) 4

(b) $\frac{27}{8}$

(c) $3 + \sqrt{3}$

(d) $z^3 + 3z^2h + 3zh^2 + h^3 - 2z - 2h + 3$

28.

(a) $[-4, 4]$

(b) $[-3, 2]$

(c) $(-2, 0), \left(\frac{3}{5}, 0\right)$

(d) $\left(0, \frac{3}{4}\right)$

(e) $\left(-2, \frac{3}{5}\right)$

(f) $[-4, -2) \cup \left(\frac{3}{5}, 4\right)$

(g) $(-3, -2), (3, -3)$

(h) $(-1, 2)$