

1. (6 points) Evaluate the following expressions:

(a)  $-2(6 - 8)^3 - (4 - 7)^2(1 + 5^1)$

(b)  $\frac{(12 - 22)^2}{|-2 \cdot 3 \cdot 10|} + \left| \frac{22 - 3 \cdot 11}{77} \right| - \frac{-|-33^0|}{2}$

(c)  $\frac{1 - 4^{(3-2)}}{3 \cdot 3^2} \div \frac{6 - (-2)^2}{6^2 - 3^2}$

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

(a)  $-[5x - (2 + 7x)]^2 + \frac{4}{3}(9 - 12x)$

(b)  $4[3x(x + 1) - (2 - x)] - 3(2x - 1)(2x + 1)$

3. (2 points) A pair of shoes is on sale at \$ 195. If the original price is \$ 300, what is the discount rate?  
[Recall: Sale Price = Original Price - Original Price · Discount Rate]

4. (2 points) How long will it take for a principal of \$5000 to earn \$600 in interest, if the annual interest rate is 3%? [Recall:  $I = Prt$ ]

5. (6 points) Solve for  $x$  in the following equations:

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

(b)  $x - \frac{x}{2} + \frac{x + 2}{6} = \frac{5 - 6x}{6}$

(c)  $(x + 10)^2 = (x - 9)(x + 9) + 3x$

6. (5 points) Consider the points  $A(5, -3)$  and  $B(2, -1)$ .

(a) Find the equation of the line that passes through  $A$  and  $B$ ;

(b) Find the equation of the vertical line passing through  $B$ ;

(c) Find the midpoint between the points  $A$  and  $B$ .;

(d) Find the distance between the points  $A$  and  $B$ .

7. (4 points) Consider the line that passes through the point  $(-2, -1)$  and is parallel to  $6x + 2y = -4$ .

(a) Find the equation of the line.

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

8. (3 points) Solve the following linear system by **the method of substitution**.

$$\frac{1}{2}x - 3y = 2$$

$$-x + 2y = 4$$

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

$$5x - 3y = 18$$

$$-4x + 2y = -11$$

10. (4 points) Simplify each of the following expressions and present the result without negative exponents. You may assume that all variables are positive.

(a)  $-(2x^2y^{-3}z^0)^3(-4xy^2z^{-1})^{-2}$

(b)  $\left(\frac{-2x^{-3}yz^3}{14xz^3}\right)^{-2}$

11. (4 points) Factor each polynomial completely:

(a)  $3x^2 + 5x - 2$

(b)  $x^2(4y^2 - 9) + x^5(4y^2 - 9)$

12. (3 points) Solve the equation  $\sqrt{6x + 15} = x + 4$  or show that it has no solutions.

13. (6 points) Solve the following equations **by factoring**:

(a)  $2x^3 - 18x = 16x^2$

(b)  $x^3 - 9x = 2x^2 - 18$

14. (3 points) By **taking square roots**, find all solutions to  $25\left(\frac{2}{5}x - \frac{1}{5}\right)^2 - 8 = 0$ .

15. (3 points) By **completing the square**, find all solutions to  $x^2 - 8x + 22 = 7$ .

16. (3 points) By using **the Quadratic Formula**, find all solutions to  $-2x^2 - 4 = x$ .

17. (8 points) Simplify each of the following expressions. You may assume that all variables are positive.

(a)  $-2\sqrt{27} + \sqrt{300} - 13\sqrt{48}$

(b)  $(4\sqrt{6} - \sqrt{2})(\sqrt{6} - 2\sqrt{2})$

(c)  $\sqrt{1200x^{12}y^{11}z^9}$

(d)  $\sqrt{\frac{50x^3y}{162x^{-8}y^{-4}}}$

18. (4 points) Rationalize the denominator of each expression and simplify:

(a)  $\frac{5}{\sqrt{3} - \sqrt{2}}$

(b)  $\frac{33\sqrt{2}}{4\sqrt{3}}$

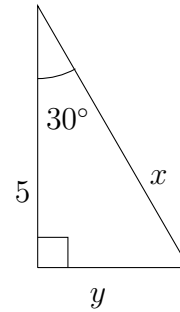
19. (4 points) Evaluate the following expression:  $\log_5 125 + \log_3 \frac{1}{81} - \ln(e^{-17})$

20. (4 points) Solve each equation for  $x$ :

(a)  $64^{3-2x} + 11^2 = 122$

(b)  $\frac{1}{32^{x-4}} = 4^{x+1}$

21. (2 points) Find the exact values of  $x$  and  $y$  in the triangle below:

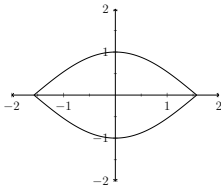


22. (3 points) If  $\tan \theta = 5$  for an acute angle in a triangle, find the exact values of the other five trigonometric functions.

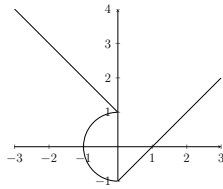
23. (2 points) Find the exact value of the following expression:  $\sin 60^\circ - \cos 45^\circ$

24. (2 points) Which of the following curves are graphs of relations for which  $y$  is a function of  $x$ :

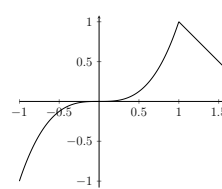
a)



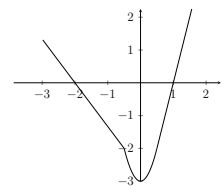
b)



c)



d)



25. (5 points) Given  $f(x) = x^2 + 2x - 3$  and  $g(x) = \frac{2}{3}x + 1$ , evaluate and simplify the following expressions

(a)  $f(-1) - g(3) =$

(b)  $\frac{f(1)}{g(6)} =$

(c)  $f(x + h) =$

26. (5 points) For the function  $f$ , whose graph is given below, answer the following questions:

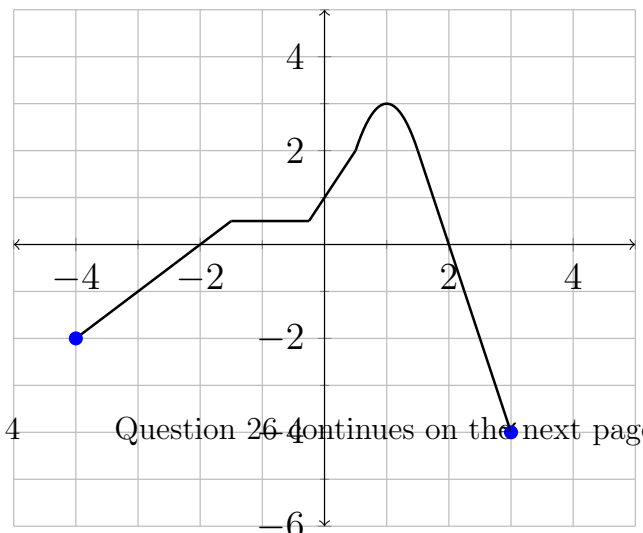
(a) the domain of  $f(x)$ ;

(b) the range of  $f(x)$ ;

(c) the x-intercept(s);

(d) the y-intercept;

(e)  $f(-3) + f(3)$ ;



Answers

1. (a)  $-38$

(b)  $\frac{97}{42}$

(c)  $-\frac{3}{2}$

2. (a)  $-4x^2 - 24x + 8$

(b)  $16x - 5$

3. 35%

4. 4 years

5. (a)  $x = 4$

(b)  $x = \frac{3}{10}$

(c)  $x = -\frac{181}{17}$

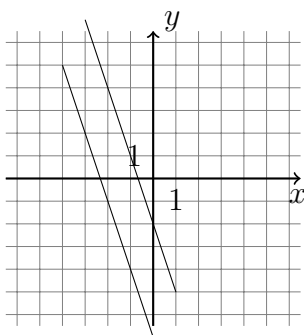
6. (a)  $y = -\frac{2}{3}x + \frac{1}{3}$

(b)  $x = 2$

(c)  $(\frac{7}{2}, -2)$

(d)  $\sqrt{13}$

7. (a)  $y = -3x - 7$



(b)

8.  $x = -8, y = -2$

9.  $x = -\frac{3}{2}, y = -\frac{17}{2}$

10. (a)  $-\frac{x^4 z^2}{2y^{13}}$

(b)  $\frac{49x^8}{y^2}$

11. (a)  $(3x - 1)(x + 2)$

(b)  $x^2(1 + x)(1 - x + x^2)(2y - 3)(2y + 3)$

12.  $x = -1$

13. (a)  $x = 0, x = 9, x = -1$

(b)  $x = 3, x = -3, x = 2$

14.  $x = \frac{1 \pm 2\sqrt{2}}{2}$

15.  $x = 3, x = 5$

16. no solution

17. (a)  $-48\sqrt{3}$

(b)  $28 - 18\sqrt{3}$

(c)  $20x^6 y^5 z^4 \sqrt{3yz}$

(d)  $\frac{5x^2 y^2 \sqrt{xy}}{9}$

18. (a)  $5(\sqrt{3} + \sqrt{2})$

(b)  $\frac{11\sqrt{6}}{4}$

19. 16

20. (a)  $x = \frac{3}{2}$

(b)  $x = \frac{18}{7}$

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

22.  $\sin \theta = \frac{5}{\sqrt{26}}, \cos \theta = \frac{1}{\sqrt{26}}, \csc \theta = \frac{\sqrt{26}}{5}, \sec \theta = \sqrt{26}, \cot \theta = \frac{1}{5}$

23.  $\frac{\sqrt{3} - \sqrt{2}}{2}$

24. c) and d)

25. (a)  $-7$

(b) 0

(c)  $x^2 + 2xh + h^2 + 2x + 2h - 3$

26. (a)  $[-4, 3]$

(b)  $[-4, 3]$

(c)  $(-2, 0), (2, 0)$

(d)  $(0, 1)$

(e)  $-5$