1. (6 points) Evaluate the following expressions:

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

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

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

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) $x - \dfrac{x}{2} + \dfrac{x+2}{6} = \dfrac{5-6x}{6}$

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

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 $25(\frac{2}{5}x - \frac{1}{5})^2 - 8 = 0$.

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) $\sqrt{\dfrac{50x^3y}{162x^{-8}y^{-4}}}$

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

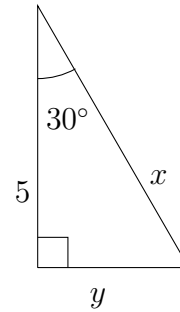(a) $\dfrac{5}{\sqrt{3} - \sqrt{2}}$

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

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) $\dfrac{1}{32^{x-4}} = 4^{x+1}$

21. (2 points) Find the exact values of x and y in the triangle below:
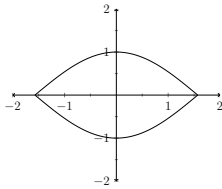
22. (3 points) If $\tan\theta = 5$ for an acute angle in a triangle, find the exact values of the other five trigonometric functions.
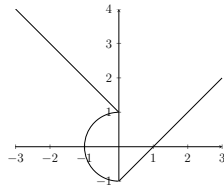
23. (2 points) Find the exact value of the following expression: $\sin 60° - \cos 45°$

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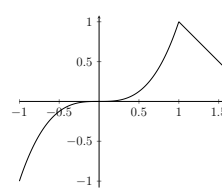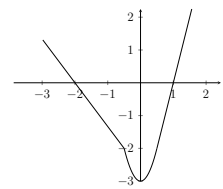
a)   b)   c)   d)

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) $\dfrac{f(1)}{g(6)} =$

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

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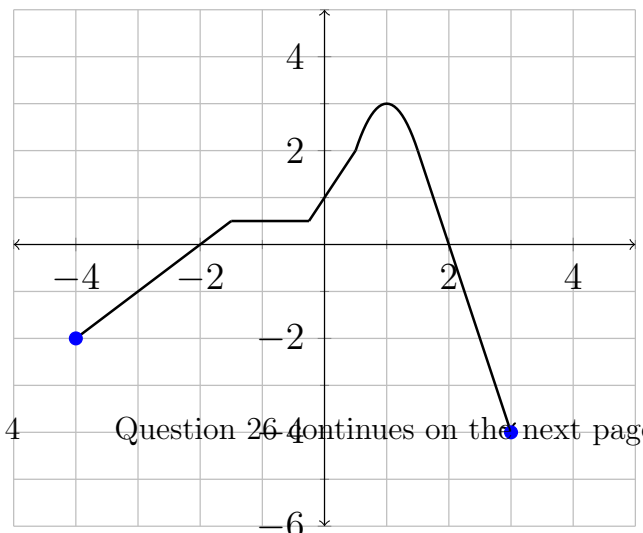
  (a) the domain of $f(x)$;

  (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) $x = \frac{3}{10}$
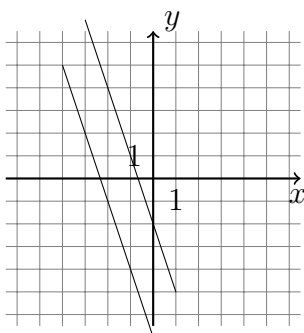
   (c) $x = -\frac{181}{17}$

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

   (b) $x = 2$

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

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

    (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