

1. (6 points) Evaluate the following expressions:

(a)  $26 - [|5 - 20^0 - 6| + (4 - 5)^3(-6 + 10^1)]$

(b)  $\left(\frac{2}{5} - \frac{1}{3}\right) + \left(\frac{2}{3} \div \frac{5}{4}\right)$

(c)  $\frac{5^2 - 5^{(5-4)}}{2 \cdot 2^3} \div \frac{6 \cdot (-2)^2}{5 + |4 - 7|}$

2. (2 points) A phone originally sells for \$300, but is put on sale for only \$195. What is the discount rate? [Recall: Sale Price = Original Price – Original Price · Discount Rate]

3. (2 points) Suppose Jan borrows \$1500 at a simple annual interest rate. After two years Jan pays off the loan with a payment of \$2040. What was the annual interest rate charged? [Recall:  $I = Prt$ ]

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

(a)  $6(5 + 3x) + (2x - 1)(x - 7)$

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

5. (4 points) Simplify each of the following expressions and present the result without negative exponents. You may assume that all variables are positive.

(a)  $(4x^2y^{-3}z^0)^3(4xy^2z^{-1})^{-5}$

(b)  $\left(\frac{-16x^{-3}y^3z}{4xy^3z^{-4}}\right)^{-2}$

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

(a)  $4(3x - 1) - 2(x + 1) = 2 + 2(x - 1) - 6(2x - 1)$

(b)  $x + \frac{25 - x}{9} = \frac{x}{3} - \frac{5}{3}$

(c)  $(2x + 1)^2 = (2x - 3)(2x + 3)$

7. (8 points) Simplify each of the following expressions. You may assume that all variables are positive.

(a)  $4\sqrt{45} - 2\sqrt{500} - 3\sqrt{125}$

(b)  $(\sqrt{7} - 2\sqrt{3})(5\sqrt{7} - \sqrt{3})$

(c)  $5x^3z^2\sqrt{9x^7y^{16}z^{-6}}$

(d)  $\sqrt{\frac{4x^2y}{81x^{-3}y^5}}$

8. (5 points) Consider the points  $A(-3, 11)$ ,  $B(1, 5)$ , and  $C(6, 0)$ .
- (a) Find the equation of the line that passes through  $B$  and  $C$ ;
  - (b) Find the equation of the line passing through  $A$  and parallel to the line  $x = 5$ ;
  - (c) Find the midpoint between the points  $A$  and  $C$ ;
  - (d) Find the distance between the points  $A$  and  $B$ .
9. (4 points) Consider the line that passes through the point  $(2, -1)$  and is parallel to  $2x + 4y = -8$ .
- (a) Find the equation of the line.
  - (b) Sketch **both** lines in the same coordinate system.
10. (3 points) Solve the following linear system by **the method of elimination**.
- $$4x - y = 2$$
- $$2x + y = 4$$
11. (3 points) Solve the following linear system by **the method of substitution**.
- $$5x + y = 16$$
- $$-x + 2y = -1$$
12. (4 points) Factor each polynomial completely:
- (a)  $2x^2 - x - 15$
  - (b)  $x^2(x^2 - 25) - 9(x^2 - 25)$
13. (3 points) Solve the equation  $\sqrt{7 + 3x} = x + 3$  or show that it has no solutions.
14. (6 points) Solve the following equations **by factoring**:
- (a)  $x^3 + 36x = 4x^3 + 3x^2$
  - (b)  $(3x + 2)(x + 1) = 10$
15. (3 points) By **taking square roots**, find all solutions to  $25(x - \frac{1}{2})^2 - 16 = 0$ .
16. (3 points) By **completing the square**, find all solutions to  $x^2 - 6x + 5 = 12$ .
17. (3 points) By using **the Quadratic Formula**, find all solutions to  $2x^2 + 1 = 4x$ .
18. (4 points) Rationalize the denominator of each expression and simplify:
- (a)  $\frac{10}{\sqrt{5} - \sqrt{2}}$
  - (b)  $\frac{\sqrt{15} + \sqrt{20}}{\sqrt{5}}$

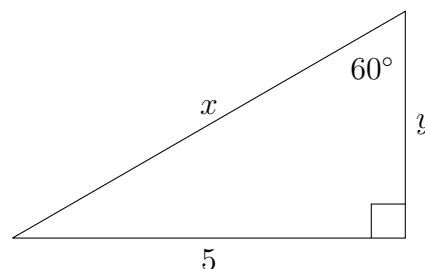
19. (4 points) Evaluate the following expression:  $\log_7 49 + \log_2 \frac{1}{16} - \ln(e^{-21})$

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

(a)  $25^{5-3x} + 3^3 = 28$

(b)  $9^{3x+6} = 27^{x-2}$

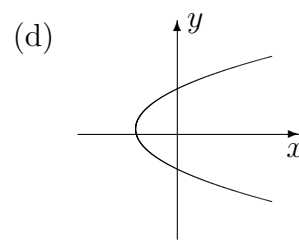
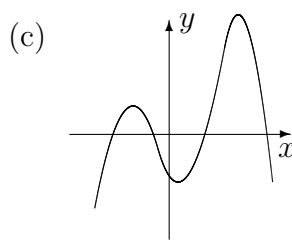
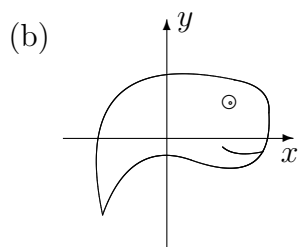
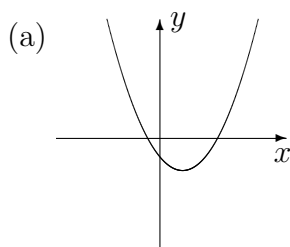
21. (2 points) Find the exact values of  $x$  and  $y$  in this triangle:



22. (3 points) If  $\sec \theta = 7$  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:  $\cos 30^\circ - \sin 45^\circ$

24. (2 points) Which of the following curves are graphs of relations for which  $y$  is a function of  $x$  (and which are not):



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

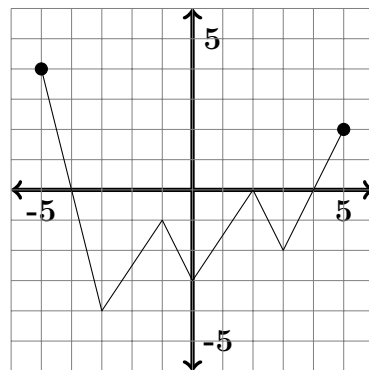
(a)  $f(1) - g(6) =$

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

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

**26.** (5 points) For the function (whose graph is given), find:

- (a) the domain,
- (b) the range,
- (c) the  $x$  and  $y$  intercepts,
- (d) the intervals where the function is positive,
- (e) the intervals where the function is negative,
- (f) the local extrema.



# Answers

1. (a) 28  
(b)  $\frac{3}{5}$   
(c)  $\frac{5}{12}$
  2. 35%
  3. 18%
  4. (a)  $2x^2 + 3x + 37$   
(b)  $x^2 - 12x + 22$
  5. (a)  $\frac{xz^5}{16y^{19}}$   
(b)  $\frac{x^8}{16z^{10}}$
  6. (a)  $x = \frac{3}{5}$   
(b)  $x = -8$   
(c)  $x = -\frac{5}{2}$
  7. (a)  $-23\sqrt{5}$   
(b)  $41 - 11\sqrt{21}$   
(c)  $\frac{15x^6y^8\sqrt{x}}{z}$   
(d)  $\frac{2x^2\sqrt{x}}{9y^2}$
  8. (a)  $y = -x + 6$   
(b)  $x = -3$   
(c)  $(\frac{3}{2}, \frac{11}{2})$   
(d)  $2\sqrt{13}$
  9. (a)  $y = \frac{-1}{2}x$   
(b)
10.  $x = 1, y = 2$
  11.  $x = 3, y = 1$
  12. (a)  $(2x + 5)(x - 3)$   
(b)  $(x + 3)(x - 3)(x + 5)(x - 5)$
  13.  $x = -2, -1$
  14. (a)  $x = -4, 0, 3$   
(b)  $x = -\frac{8}{3}, 1$
  15.  $x = -\frac{3}{10}, \frac{13}{10}$
  16.  $x = -1, 7$
  17.  $x = \frac{2 \pm \sqrt{2}}{2} = 1 \pm \frac{1}{2}\sqrt{2}$
  18. (a)  $\frac{10(\sqrt{5} + \sqrt{2})}{3}$   
(b)  $\sqrt{3} + 2$
  19. 19
  20. (a)  $x = \frac{5}{3}$   
(b)  $x = -6$
  21.  $x = \frac{10\sqrt{3}}{3}, y = \frac{5\sqrt{3}}{3}$
  22.  $\sin \theta = \frac{4\sqrt{3}}{7}, \cos \theta = \frac{1}{7}, \tan \theta = 4\sqrt{3},$   
 $\csc \theta = \frac{7\sqrt{3}}{12}, \sec \theta = 7, \cot \theta = \frac{\sqrt{3}}{12}$
  23.  $\frac{\sqrt{3} - \sqrt{2}}{2}$
  24. (a) Yes (b) No (c) Yes (d) No
  25. (a)  $-4$   
(b)  $\frac{1}{5}$   
(c)  $2xh + h^2 - h$
  26. (a)  $[-5, 5]$   
(b)  $[-4, 4]$   
(c)  $(-4, 0), (2, 0), (4, 0), (0, -3)$   
(d)  $[-5, -4] \cup (4, 5]$   
(e)  $(-4, 2) \cup (2, 4)$   
(f) local minimums:  $(-3, -4), (0, -3)$  and  $(3, -2)$ ; local maximums:  $(-1, -1)$  and  $(2, 0),$

