

1. (6 points) Evaluate the following expressions.
  - (a)  $19 - (7 + |3 - 3^2 \cdot 2|)$
  - (b)  $\left(\frac{1}{5} - \frac{3}{8}\right) + \left(\frac{3}{4} \cdot \frac{7}{5}\right)$
  - (c)  $(4^0 - 4^2) \div \frac{2(3 - 2)}{1 + |-3|}$
2. (4 points) Expand and simplify the following algebraic expressions.
  - (a)  $5(x + 3)(4x - 3) - 5x(x + 3)$
  - (b)  $2 - (1 - x)^2$
3. (6 points) Solve for  $x$  in the following equations.
  - (a)  $12x + 2 = 8 - 2(1 - 2x) + 8x$
  - (b)  $3(7 + 5x) = 37 - [5(x + 2) - 11x]$
  - (c)  $x + \frac{7}{6} = \frac{5}{9}x - \frac{11}{18}$
4. (4 points) Simplify the following expressions. Your answers should have no negative exponents.
  - (a)  $(2x^3y^{-3}z^3)^{-2}(5x^{-1}y^2z^3)^2$
  - (b)  $\left(\frac{16a^5b^{-8}c^7}{8a^{-2}b^{-3}c^5}\right)^3$
5. (4 points) Factor completely.
  - (a)  $2x^4 + 4x^2 - 30$
  - (b)  $16d^4 - 2d$
6. (8 points) Solve the following equations *by factoring*.
  - (a)  $x^2 - 5x - 6 = 0$
  - (b)  $x^3 + 3x^2 - 4x - 12 = 0$
  - (c)  $(2x - 1)^2 - 9 = 0$
  - (d)  $6x^4 + 5x^3 - 4x^2 = 0$
7. (2 points) An exercise bike is on sale for \$390 after a discount of 25%. Find the regular price of the bike. (Recall: Sale price = Original Price - (Discount rate · Original Price))
8. (2 points) Suppose you borrow \$1600 at a simple annual interest rate. The loan with interest was to be repaid at the end of the second year. What was the annual interest rate if a total of \$2048 was repaid? (Recall:  $I = Prt$ )
9. (8 points) Simplify.
  - (a)  $4x^2z\sqrt{48x^9y^4z^{16}}$
  - (b)  $\frac{\sqrt{24x^{10}y^8z^6}}{\sqrt{2x^3y^8}}$

(c)  $2\sqrt{27} - 3\sqrt{50} - 5\sqrt{3} + \sqrt{32}$

(d)  $(\sqrt{2} - 3\sqrt{10})(\sqrt{10} + 2\sqrt{2})$

10. (3 points) Solve for
- $x$
- , or show there is no solution. Check your answer.

$$\sqrt{x+7} - 5 = x$$

11. (2 points) Rationalize the denominator and simplify.

(a)  $\frac{7\sqrt{2}}{2\sqrt{5}}$

(b)  $\frac{\sqrt{2}}{\sqrt{4} - \sqrt{8}}$

12. (3 points) By
- using the quadratic formula*
- , find the solution(s) to
- $2x^2 + x - 1 = 3x$
- .

13. (3 points) By
- completing the square*
- , find the solution(s) to
- $x^2 = 6x + 7$
- .

14. (3 points) By
- taking square roots*
- , find the solution(s) to
- $4(2x + 3)^2 - 9 = 0$
- .

15. (3 points) Solve the system by the method of substitution.

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

16. (3 points) Solve the system by the method of elimination.

$$\begin{cases} 5x - 2y = 7 \\ 6x + 4y = 2 \end{cases}$$

17. (3 points) Determine whether the following pairs of lines are parallel, perpendicular, or neither.

(a)  $\begin{cases} 4x - 2y = -14 \\ 2x + y = 7 \end{cases}$

(b)  $\begin{cases} 2x + 3y = 1 \\ 6x - 4y = 17 \end{cases}$

18. (8 points) Given points
- $A(-4, 1)$
- ,
- $B(2, 3)$
- ,
- $C(4, 3)$

(a) Write an equation for the line that passes through points  $A$  and  $B$ .(b) Write an equation for the line that passes through  $B$  and is perpendicular to the line  $x = -7$ .(c) Determine the distance between points  $A$  and  $B$ .(d) Find the midpoint of the line segment connecting the points  $A$  and  $C$ .

19. (5 points) Given
- $f(x) = 2x^2 + 7x + 9$
- and
- $g(x) = 4 - 5x$
- , find the following:

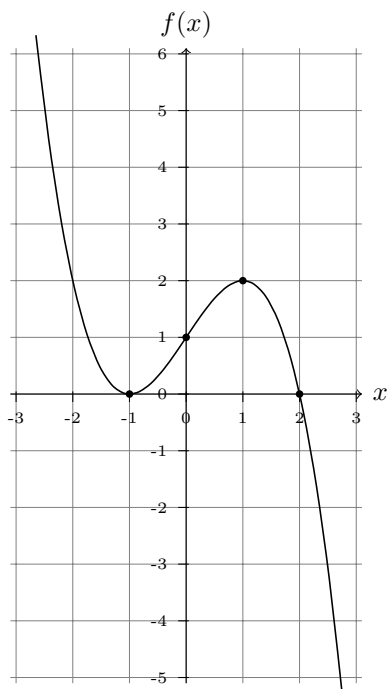
(a)  $f(-1)$

(b)  $g(-2)$

(c) the value(s) of  $x$  where  $g(x) = 0$ 

(d)  $f(2) - g(-2)$

20. (6 points) Find the domain, range, intercepts, sign (where  $f(x)$  is positive/negative) and extrema (local max/min) of the following function.



21. (6 points) Solve the following exponential equations for  $x$ .

(a)  $9^{x+4} = 27^{5x-3}$

(b)  $3(2 + e^{\frac{x}{4}}) = 27$

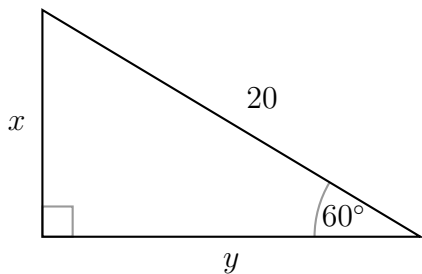
(c)  $2^{x+2} = 3$

22. (3 points) Let  $\theta$  be an acute angle of a right triangle.

Given  $\tan(\theta) = \frac{1}{2}$ , find the exact values of  $\sin(\theta)$  and  $\sec(\theta)$ .

23. (2 points) Given  $\sec(\theta) = \frac{2}{\sqrt{3}}$ , find the acute angle  $\theta$ .

24. (3 points) Find the exact values of  $x$  and  $y$ .



**Answers**

1. (a)  $-3$  (b)  $\frac{7}{8}$  (c)  $-30$
2. (a)  $15x^2 + 30x - 45$  (b)  $-x^2 + 2x + 1$
3. (a) No solution (b)  $\frac{2}{3}$  (c)  $x = -4$
4. (a)  $\frac{25y^{10}}{4x^8}$  (b)  $\frac{8a^{21}c^6}{b^{15}}$
5. (a)  $2(x^2 + 5)(x^2 - 3)$  (b)  $2d(2d - 1)(4d^2 + 2d + 1)$
6. (a)  $x = -1$  and  $x = 6$  (b)  $x = -3, x = -2,$  and  $x = 2$   
(c)  $x = -1$  and  $x = 2$  (d)  $x = -\frac{4}{3}, x = 0,$  and  $x = \frac{1}{2}$
7. \$520
8. 14%
9. (a)  $16x^6y^2z^9\sqrt{3x}$  (b)  $2x^3z^3\sqrt{3x}$  (c)  $\sqrt{3} - 11\sqrt{2}$  (d)  $-26 - 10\sqrt{5}$
10.  $x = -3$  ( $x = -6$  is not a solution)
11. (a)  $\frac{7\sqrt{10}}{10}$  (b)  $-\frac{2+\sqrt{2}}{2}$
12.  $x = \frac{1 \pm \sqrt{3}}{2}$
13.  $x = -1$  and  $x = 7$
14.  $x = -\frac{9}{4}$  and  $x = -\frac{3}{4}$
15.  $x = 2$  and  $y = 6$
16.  $x = 1$  and  $y = -1$
17. (a) Neither (b) Perpendicular
18. (a)  $y = \frac{1}{3}x + \frac{7}{3}$  (b)  $y = 3$  (c)  $d = 2\sqrt{10}$  (d)  $(0, 2)$
19. (a) 4 (b) 14 (c)  $x = \frac{4}{5}$  (d) 17
20. Domain:  $\mathbb{R}$ , Range:  $\mathbb{R}$ ,  $x$ -ints:  $(-1, 0), (2, 0)$ ,  $y$ -int:  $(0, 1)$ , Positive:  $(-\infty, 2]$ , Negative:  $[2, \infty)$ ,  
Local max:  $(1, 2)$ , Local min:  $(-1, 0)$
21. (a)  $x = \frac{17}{13}$  (b)  $x = 4 \ln(7)$  (c)  $x = -2 + \log_2(3)$
22.  $\sin(\theta) = \frac{\sqrt{5}}{5}$   $\sec(\theta) = \frac{\sqrt{5}}{2}$
23.  $\theta = 30^\circ$
24.  $x = 10\sqrt{3}$