1. (5 points) Evaluate the following expressions.

(a) $10 - 3(5^0 - 4)^2 + |1 - 6| \div \frac{2}{3}$

(b) $\dfrac{-1}{8} \cdot \left(\dfrac{4 \times 6 - 2 \times 10}{7^2 - 50}\right)^2$

2. (3 points) Expand and simplify the following expression.

$2(3x - 1)^2 - (4x + 2)(2x - 5)$

3. (8 points) Solve for x in the following equations. Simplify your answers.

(a) $8x - 3(2x - 1) = 5(2x + 3)$

(b) $(x + 4)(x - 7) = 5x + 4 + x^2$

(c) $\dfrac{3 - 6x}{10} = \dfrac{x - 3}{2} - \dfrac{2x + 5}{5}$

4. (4 points) Simpify the following expression and present the result without any negative exponents. You may assume that all variables are positive.

$$\frac{(2ab^{-1})^3 a^{-10}}{12b^4c^{-12}} \left(\frac{-1}{a^4}\right)^2$$

5. (3 points) Fully factor the following expression.

$80x^4 - 410x^3 + 50x^2$

6. (8 points) Solve for x by **factoring**.

(a) $40x^3 + 12x^2 - 90x - 27 = 0$

(b) $(x + 8)(x - 6) = 10x$

7. (3 points) Solve for x by **using the quadratic formula**, or state that there is no solution, as applicable.

$2x^2 = 4 - 7x$

8. (7 points) Simplify the following expressions. You may assume that all variables are positive. Note that a simplified expression should not contain negative exponents.

(a) $\sqrt{12} - 2\sqrt{6}(4\sqrt{3} - \sqrt{2})$

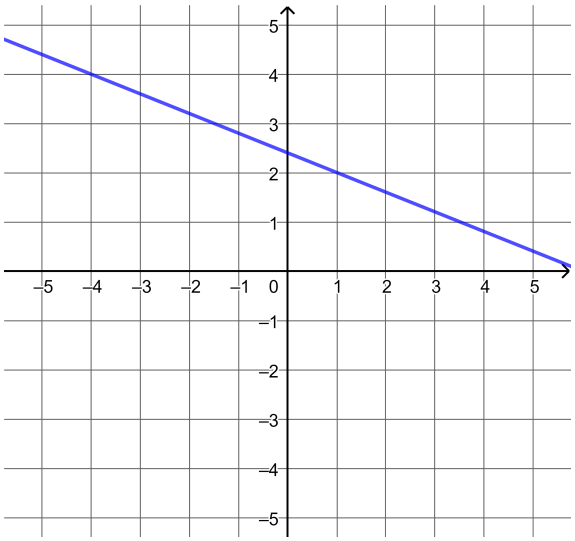
(b) $\dfrac{14a^{-5}\sqrt{ab^{11}}}{\sqrt{4a^{13}b^9}}$

9. (4 points) Rationalize the denominator and simplify.

(a) $\dfrac{4\sqrt{3}}{3\sqrt{2}}$

(b) $\dfrac{\sqrt{2}}{5\sqrt{2} + 7}$

10. (1 point) Find the slope of the line illustrated below.



11. (6 points) Give an equation for each of the lines described.

(a) The line through the points $(9, -7)$ and $(5, 5)$.

(b) The line through the point $(-5, 20)$ that is parallel to the line $y = 7x - 13$.

(c) The line through the point $(-2, -3)$ that is perpendicular to the line $2x - 11y = 26$.

12. (1 point) Find the equation of the vertical line through the point $(17, 85)$.

13. (3 points) Consider the line segment $\overline{AB}$ that connects the points $A(-2, 2)$ and $B(4, -1)$.

(a) Give the coordinates of the midpoint of the line segment $\overline{AB}$.

(b) Calculate the length of the line segment $\overline{AB}$. Simplify your answer.

14. (9 points) Solve for x.

(a) $10 - \frac{1}{3}\sqrt{14 - 11x} = 8$

(b) $4 = -x + \sqrt{6x + 31}$

15. (3 points) Solve the following system of equations by **substitution**.

$$\begin{cases} 6x - 2y = 10 \\ 3x + 2y = -7 \end{cases}$$

16. (3 points) Solve the following system of equations by **elimination**.

$$\begin{cases} 12x + 5y = 3 \\ 4x + 3y = 5 \end{cases}$$

17. (7 points) Solve for x in the following equations. Simplify your answers.

(a) $4^{x-3} \cdot 8^{3x+2} = 2$

(b) $8 = 14 - 3(21^{4-7x})$

18. (3 points) Evaluate the following expressions.

(a) $\log_7(49)$

(b) $\ln(e^6 e^{13})$

(c) $\log_2\left(\frac{2}{64}\right)$

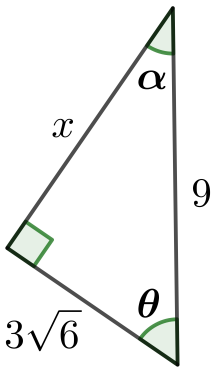
19. (5 points) Use the image below to find the following values. Simplify your answers.

(a) Find the length x of the third side of the triangle.

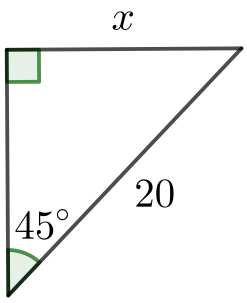
(b) $\sin\alpha$

(c) $\tan\theta$

(d) $\sec\alpha$



20. (2 points) Find the length x of the side in the triangle illustrated below.



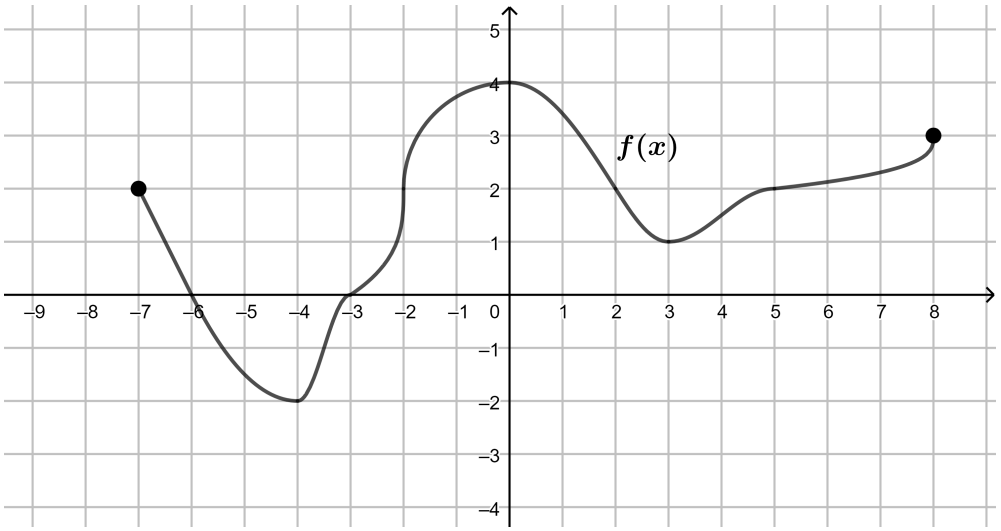
21. (2 points) Evaluate $8[\sin(60°)]^2$.

22. (4 points) Let $f(x) = \sqrt{3x+10}$ and let $g(x) = x^2 - x - 3$. Find simplified expressions for the following:

(a) $f(30)$

(b) $g(x+1)$

23. (6 points) Let $f(x)$ be the function illustrated in the graph below.



(a) Give the domain of $f(x)$.

(b) Give the range of $f(x)$.

(c) Find the value of $f(-4)$.

(d) Give the coordinates of the x-intercept(s).

(e) Over which interval(s) is $f(x)$ decreasing?

(f) List the relative (local) minima of $f(x)$.

ANSWERS

1. (a) $\frac{-19}{2}$ (b) -2
2. $10x^2 + 4x + 12$
3. (a) $x = \frac{-3}{2}$ (b) $x = -4$ (c) $x = 4$
4. $\frac{2c^{12}}{3a^{15}b^7}$
5. $10x^2(8x - 1)(x - 5)$
6. (a) $x = \pm\frac{3}{2}$, $\frac{-3}{10}$ (b) $x = -4$, 12
7. $x = -4$, $\frac{1}{2}$
8. (a) $-24\sqrt{2} + 6\sqrt{3}$ (b) $\frac{7b}{a^{11}}$
9. (a) $\frac{2\sqrt{6}}{3}$ (b) $10 - 7\sqrt{2}$
10. $\frac{-2}{5}$
11. (a) $y = -3x + 20$ (b) $y = 7x + 55$ (c) $y = \frac{-11}{2}x - 14$
12. $x = 17$
13. (a) $\left(1, \frac{1}{2}\right)$ (b) $3\sqrt{5}$
14. (a) $x = -2$ (b) $x = 3$
15. $x = \frac{1}{3}$, $y = -4$
16. $x = -1$, $y = 3$
17. (a) $x = \frac{1}{11}$ (b) $x = \frac{4 - \log_{21}(2)}{7}$
18. (a) 2 (b) 19 (c) -5
19. (a) $3\sqrt{3}$ (b) $\frac{\sqrt{6}}{3}$ (c) $\frac{\sqrt{2}}{2}$ (d) $\sqrt{3}$

 Question 23 continues on the next page.

20. $10\sqrt{2}$
21. 6
22. (a) 10 (b) $x^2 + x - 3$
23. (a) $[-7, 8]$ (b) $[-2, 4]$ (c) -2 (d) $(-6, 0)$ and $(-3, 0)$ (e) $(-7, -4) \cup (0, 3)$
$x = -4$, 3