1. (5 points) Evaluate the following expressions.

(a) $5^0 - 90 \div |2 + 4(1-3)^{-7+10}|$

(b) $\dfrac{(-4)^2 - 10}{-15 + 4 \times 5} \div \dfrac{9-2}{10} - \dfrac{7}{2}$

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

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

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

(a) $-x + 3(2x - 5) = 11x - 5$

(b) $(2x - 1)(x - 8) = 2x^2 + 3x - 2$

(c) $\dfrac{5x + 3}{6} = \dfrac{x}{3} - \dfrac{x + 1}{2}$

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

$4a^7 \cdot \dfrac{(-10ab^{-6})^3 b^4}{200a^{-13}b^7}$

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

$5x^5 - 35x^4 + 50x^3$

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

(a) $3x^3 - 2x^2 - 300x + 200 = 0$

(b) $(3x - 1)(2x - 5) = 8$

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

$2x^2 - 3x + 4 = -6$

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) $(3\sqrt{2} - 2\sqrt{10})(\sqrt{2} + 4\sqrt{10})$

(b) $\dfrac{9a\sqrt{8a^7b^{-2}}}{\sqrt{a^{-10}b^{16}}}$

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

(a) $\dfrac{9\sqrt{5}}{4\sqrt{3}}$

(b) $\dfrac{4}{7 + 3\sqrt{5}}$

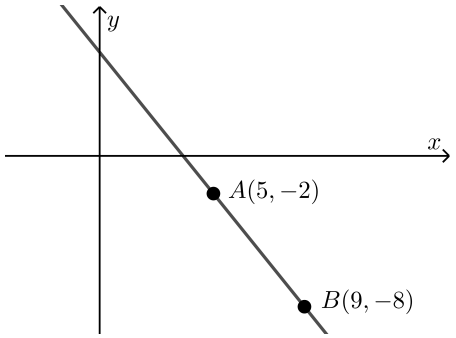
10. (4 points) Give an equation for each of the lines described.

 Question 10 continues on the next page.

(a) The line parallel to $4x + 17y = 9$ with a y-intercept of -6.

(b) The line through the point $(58, -22)$ that is parallel to the y-axis.

11. (7 points) Consider the points A and B in the image below.



(a) Give the coordinates of the midpoint between points A and B.

(b) Calculate the distance separating the points A and B. Simplify your answer.

(c) Give the equation of the line illustrated above (the line passing through the points A and B).

(d) Give the slope of a line that is perpendicular to the line illustrated above.

12. (9 points) Solve for x.

(a) $3(4 + \sqrt{1 - 4x}) = 21$

(b) $x = 2 + \sqrt{2x - 1}$

13. (3 points) Solve the following system of equations by **substitution**.

$$\begin{cases} 4x + y = -4 \\ -3x + 2y = 25 \end{cases}$$

14. (3 points) Solve the following system of equations by **elimination**.

$$\begin{cases} 6x - 5y = 8 \\ -2x + 3y = -8 \end{cases}$$

15. (7 points) Solve for x in the following equations. Simplify your answers.

(a) $3^{4x+3} = \left(\frac{1}{9}\right)^{x+8}$

(b) $6 + 8(11^{7-2x}) = 30$

16. (4 points) Evaluate the following expressions.

(a) $\log_2(8)$

(b) $\log_{35}(1)$

(c) $\ln\left(\dfrac{e^{19}}{e^8}\right)$

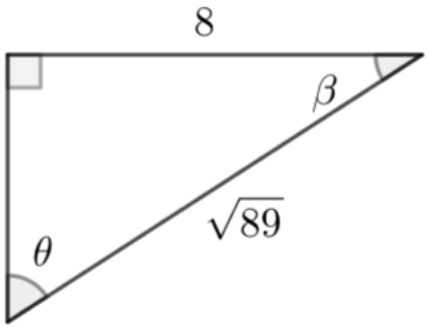
(d) $\log_4(4 + 12)$

17. (4 points) Use the image below to find simplified values for

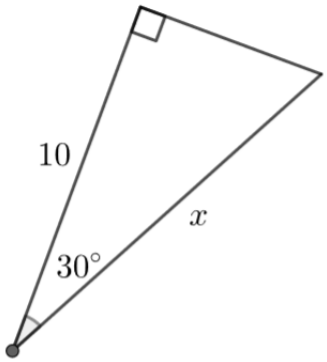
 Question 17 continues on the next page.

(a) $\cos\beta$

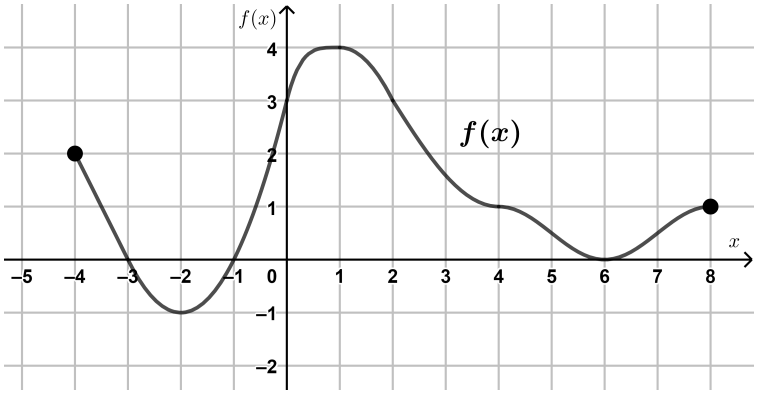
(b) $\tan\theta$



18. (3 points) Find the length x in the triangle illustrated below.



19. (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) Over which interval(s) is $f(x)$ positive?

 Question 19 continues on the next page.

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

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

20. (5 points) Let $f(x) = \dfrac{\sqrt{10-3x}}{x}$ and let $g(x) = 2x^2 + f(x)$. Find simplified expressions for the following:

(a) $f(3)$

(b) $f(x+2)$

(c) $g(-5)$

ANSWERS

1. (a) -2 (b) $\frac{-25}{14}$
2. $-16x^2 + 31x - 19$
3. (a) $x = \frac{-5}{3}$ (b) $x = \frac{1}{2}$ (c) $x = -1$
4. $\frac{-20a^{23}}{b^{21}}$
5. $5x^3(x-5)(x-2)$
6. (a) $x = \pm 10, \frac{2}{3}$ (b) $x = \frac{-1}{6}, 3$
7. no solution
8. (a) $-74 + 20\sqrt{5}$ (b) $\frac{18a^9\sqrt{2a}}{b^9}$
9. (a) $\frac{3\sqrt{15}}{4}$ (b) $7 - 3\sqrt{5}$
10. (a) $y = \frac{-4}{17}x - 6$ (b) $x = 58$
11. (a) $(7, -5)$ (b) $2\sqrt{13}$ (c) $y = \frac{-3}{2}x + \frac{11}{2}$ (d) $\frac{2}{3}$
12. (a) $x = -2$ (b) $x = 5$
13. $x = -3$, $y = 8$
14. $x = -2$, $y = -4$
15. (a) $x = \frac{-19}{6}$ (b) $x = \frac{7 - \log_{11}(3)}{2}$
16. (a) 3 (b) 0 (c) 11 (d) 2
17. (a) $\frac{8\sqrt{89}}{89}$ (b) $\frac{8}{5}$
18. $\frac{20\sqrt{3}}{3}$
19. (a) $[-4, 8]$ (b) $[-1, 4]$ (c) 1 (d) $[-4, -3) \cup (-1, 6) \cup (6, 8]$ (e) $(-4, -2) \cup (1, 6)$ (f) $(-2, -1)$ and $(6, 0)$
20. (a) $\frac{1}{3}$ (b) $\frac{\sqrt{4-3x}}{x+2}$ (c) 49