1. (5 points) Evaluate the following expressions.

(a) $\dfrac{(6+(-2))^2-3}{0-4} \div \dfrac{3}{8} + 11^0$

(b) $10-(-3)^{-2-(-4)}\,|3+7\times(-1)|$

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

$$(2x-5)^2 - 6[x(x^2-4) - x^2 + 3x]$$

3. (6 points) Solve for x in the following equations.

(a) $3[x-4(2x-3x-2)-1]-11 = 2+5x$

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

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

$$\frac{12(3abc^3)^{-2}}{a^7b^{-9}c^0} \cdot (b^{-1}c)^{-4}$$

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

$$12x^3 + 8x^2 - 27x - 18$$

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

(a) $x^3 - 6x^2 - 16x = 0$

(b) $(3x-2)(x+4) = -11$

7. (3 points) Solve for x by **using the quadratic formula**.

$$-x^2 + 4x - 1 = 0$$

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

(a) $2\sqrt{2}(5\sqrt{2} - \sqrt{24}) + 7\sqrt{3}$

(b) $xy^2\sqrt{\dfrac{20x^7y^{-12}}{x^4y^{20}}}$

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

(a) $\dfrac{4a\sqrt{5}}{\sqrt{10a}}$

(b) $\dfrac{\sqrt{6}}{6+3\sqrt{3}}$

10. (9 points) Solve for x.

(a) $1 - 4\sqrt{15-2x} = -19$

 Question 10 continues on the next page.

(b) $3 + \sqrt{4x - 7} = x$

11. (8 points) Give an equation for each of the lines described.

(a) The line passing through the points $(2, 8)$ and $(-3, 33)$.

(b) The line perpendicular to $4x + 5y = 11$ with a y-intercept of -14.

(c) The vertical line through the point $(117, 481)$.

12. (3 points) Solve the following system of equations by **substitution**.

$$\begin{cases} 2x + 6y = 16 \\ 3x - 4y = -15 \end{cases}$$

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

$$\begin{cases} 5x - 4y = -25 \\ -7x + 2y = -1 \end{cases}$$

14. (4 points) Consider the points $A(-4, 5)$ and $B(-1, -1)$.

(a) What distance separates the points A and B? Remember to simplify your answer.

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

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

(a) $4^{6x-2} = \left(\frac{1}{2}\right)^{2x+3}$

(b) $4(5^{8x-11}) - 4 = 20$

16. (4 points) Evaluate the following expressions.

(a) $\log_2(32)$

(b) $\ln(e^4 e^3)$

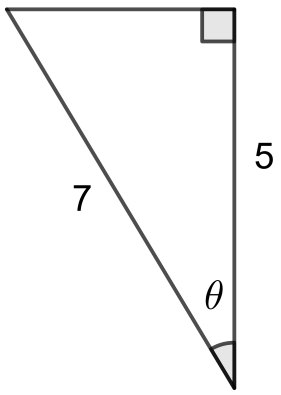
(c) $\log_{2387}(1)$

(d) $\log_5\left(\frac{1}{25}\right)$

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

(a) $\sec\theta$

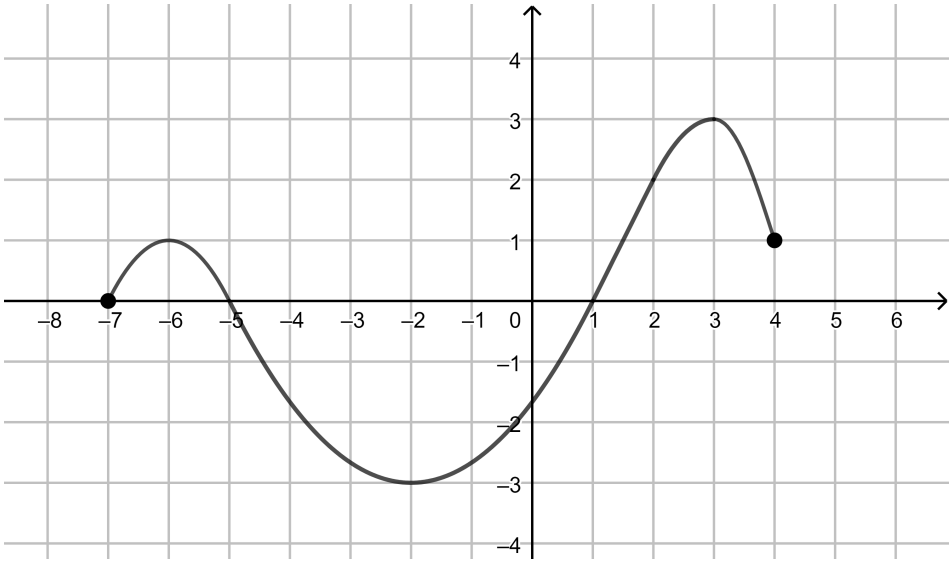
(b) $\csc\theta$



18. (4 points) Evaluate the expression and simplify.

$$\sec(30°) \times [\tan(45°) + \cos(60°)]$$

19. (5 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) Over which interval(s) is $f(x)$ increasing?

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

(e) List the relative maxima of $f(x)$.

20. (6 points) Let $f(x) = \frac{x}{x^2+2}$, let $g(x) = \sqrt{2x+1}$, and let $h(x) = x \cdot g(x^2)$. Find simplified expressions for the following:

(a) $f(4)$

(b) $g(x+t)$

(c) $f(g(12))$

(d) $h(-2)$

ANSWERS

1. (a) $\frac{-23}{3}$ (b) -26
2. $-6x^3 + 10x^2 - 14x + 25$
3. (a) $\frac{-4}{5}$ (b) 5
4. $\frac{4b^{11}}{3a^9c^{10}}$
5. $(2x+3)(2x-3)(3x+2)$
6. (a) $x = -2,\ 0,\ 8$ (b) $x = -3,\ \frac{-1}{3}$
7. $x = 2 \pm \sqrt{3}$

 Question 20 continues on the next page.

8. (a) $20 - \sqrt{3}$ (b) $\frac{2x^2\sqrt{5x}}{y^{14}}$
9. (a) $2\sqrt{2a}$ (b) $\frac{2\sqrt{6}-3\sqrt{2}}{3}$
10. (a) $x = -5$ (b) $x = 8$
11. (a) $y = -5x + 18$ (b) $y = \frac{5}{4}x - 14$ (c) $x = 117$
12. $x = -1$, $y = 3$
13. $x = 3$, $y = 10$
14. (a) $3\sqrt{5}$ (b) $\left(\frac{-5}{2}, 2\right)$
15. (a) $x = \frac{1}{14}$ (b) $x = \frac{\log_5(6)+11}{8}$
16. (a) 5 (b) 7 (c) 0 (d) -2
17. (a) $\frac{7}{5}$ (b) $\frac{7\sqrt{6}}{12}$
18. $\sqrt{3}$
19. (a) $[-7, 4]$ (b) $[-3, 3]$ (c) $(-7, -6) \cup (-2, 3)$ (d) $(-7, -5) \cup (1, 4)$ (e) $(-6, 1)$ and $(3, 3)$
20. (a) $\frac{2}{9}$ (b) $\sqrt{2x + 2t + 1}$ (c) $\frac{5}{27}$ (d) -6