1. (6 points) Evaluate the following expressions.

(a) $3 - 2(4^0 - |3 - 8|)^2$

(b) $\dfrac{[(-1)^2 - (-2)]^2}{6} + \dfrac{3 - 6}{4}$

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

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

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

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

(b) $\dfrac{3x}{4} - \dfrac{1}{2} = \dfrac{2x - 3}{3}$

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

$\dfrac{[3^5 x^{-3} y^{-5} z]^4}{3^{18} x^{-2} y^7 z^3} \cdot (x^8 y^{-9} z^{-18})^{-1}$

5. (3 points) Factor the following expression completely.

$x^3 + 3x^2 - 4x - 12$

6. (8 points) Solve the following equations <u>by factoring</u>.

(a) $24x^2 - 14x + 1 = 0$

(b) $3x^2(x - 5) = 18x$

7. (3 points) Solve the following equation <u>using the quadratic formula</u>. Simplify your answer.

$2x^2 - 3x - 2 = 0$

8. (6 points) Simplify each of the following expressions. You may assume any variables are positive.

(a) $3a^2 b^0 c \sqrt{9 a^9 b^{16} c^{25}}$

(b) $3\sqrt{6}(2\sqrt{2} + \sqrt{75}) + 2\sqrt{12}$

9. (6 points) Rationalize the denominator in each case and simplify. You may assume any variables are positive.

(a) $\dfrac{\sqrt{3 a^4 b^3 c^{-2}}}{\sqrt{6 a^3 b^7 c^5}}$

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

10. (6 points) Solve the following equation or show it has no solution.

(a) $9 - 2\sqrt{4x + 13} = 3$

(b) $\sqrt{x + 4} - 2 = x$

11. (2 points) For the line $3x - 8y = 16$, determine the x- and y- intercepts.

12. Find an equation for the line in each case.

(a) (2 points) Line through $(0, 6)$ and parallel to $y = 5x + \dfrac{1}{2}$

(b) (3 points) Through the points $(-2, -2)$ and $(-6, 4)$.

(c) (3 points) Through the point $(7, -1)$ and perpendicular to the line $3x + 2y = 7$.

(d) (2 points) Through the point $(-8, -5)$ and perpendicular to the line $y = -4$.

13. (3 points) Solve the following system of equations <u>by substitution.</u>

$$\begin{cases} 2x - 3y = 19 \\ 4x + 2y = 14 \end{cases}$$

14. (3 points) Solve the following system of equations <u>by elimination.</u>

$$\begin{cases} 4x - 3y = 11 \\ 3x - y = 7 \end{cases}$$

15. (2 points) Find the <u>distance</u> between the points $(12, -3)$ and $(8, -1)$. Simplify your answer.

16. (2 points) Find the <u>midpoint</u> between the points $(-11,\ 4)$ and $\left(5,\ \frac{3}{5}\right)$. Simplify your answer.

17. (6 points) Solve each of the following equations for x.

(a) $4^{x+2} = 8^{2x+1}$

(b) $2^{x-3} - 1 = 6$

18. (4 points) Evaluate the following expression.

$$\log_2(16) - 3\ln(e^5) + \log_3(9^{-1}) - 4\log_{18}(1)$$

19. (4 points) If $\tan\theta = 7$ for some acute angle θ in a right triangle. Determine and simplify:

(a) $\cot\theta$

(b) $\sec\theta$

20. (3 points) Find the exact value of the following expression.

$$\sin 30° - 3\tan 45°$$

21. (3 points) Solve for x in the triangle below. Simplify your answer.
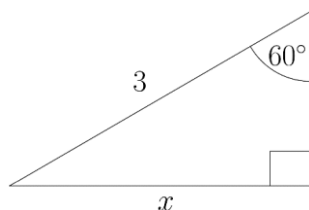
22. (4 points) Given the graph of $f(x)$, determine the characteristics below.
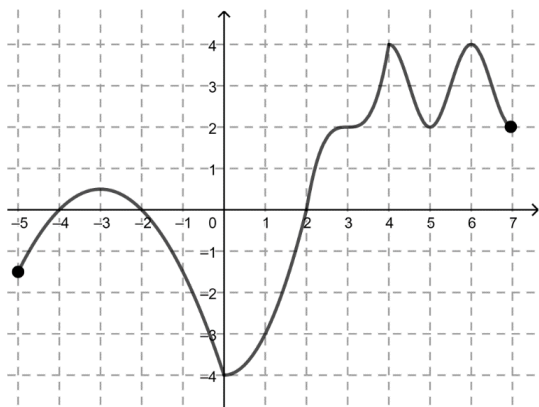
(a) The domain of f

(b) The range of f

(c) The interval(s) over which f is <u>decreasing</u>

(d) Find $f(3)$

23. (3 points) Given $g(2) = 3$ and $h(4) = -2$, evaluate $f(2)$ given:

$$f(x) = \frac{x^2[g(x)]^2}{h(x^2)}$$

ANSWERS

1. (a) -29 (b) $\frac{3}{4}$

2. $6x^2 - 11x - 48$

3. (a) $x = \frac{-16}{3}$ (b) $x = -6$

4. $\frac{9z^{19}}{x^{18}y^{18}}$

5. $(x + 3)(x + 2)(x - 2)$

6. (a) $x = \frac{1}{12}, \ x = \frac{1}{2}$ (b) $x = -1, \ x = 0, \ x = 6$

7. $x = -\frac{1}{2}, \ x = 2$

8. (a) $9a^6b^8c^{13}\sqrt{ac}$ (b) $16\sqrt{3} + 45\sqrt{2}$

9. (a) $\frac{\sqrt{2ac}}{2b^2c^4}$ (b) $2 + \sqrt{3}$

10. (a) $x = -1$ (b) $x = 0$ (Note: $x = -3$ is not a solution)

11. $\left(\frac{16}{3}, 0\right), \ (0, -2)$

12. (a) $y = 5x + 6$ (b) $y = \frac{-3}{2}x - 5$ (c) $y = \frac{2}{3}x - \frac{17}{3}$ (d) $x = -8$

13. $(5, -3)$

14. $(2, -1)$

15. $2\sqrt{5}$ units

16. $\left(-3, \ \frac{23}{10}\right)$

17. (a) $x = \frac{1}{4}$ (b) $x = \log_2(7) + 3$

18. -13

19. (a) $\frac{1}{7}$ (b) $5\sqrt{2}$

20. $\frac{-5}{2}$

21. $x = \frac{3\sqrt{3}}{2}$

22. (a) $[-5,\ 7]$ (b) $[-4,\ 4]$ (c) $[-3, 0] \cup [4, 5] \cup [6, 7]$ (d) 2

23. -18