1. (7 pts.) Simplify by adding (or subtracting) like terms wherever possible:
\[ \sqrt{5} y + \frac{1}{3} + \frac{1}{3} - y + 4 \cdot 3^\frac{1}{3} - \sqrt{3} \]

2. (7 pts.) Simplify completely: \((-2a^{-3}b)^{2} \left( \frac{4a^{-5}b^{2}c}{b^{0}c^{-4}} \right)\)

3. (7 pts.) Simplify completely: \((\sqrt{12} - \sqrt{27})^{2}\)

4. (7 pts.) Simplify completely: \(\left( \frac{16^{\frac{3}{4}}}{8^{\frac{2}{3}} + 16^{\frac{3}{4}}} \right)^{-1}\)

5. (6 pts.) Let \(f(x) = 7 + \frac{1}{2}x + 4\). Find all inputs, \(x\), such that \(f(x) < 5\).

6. (6 pts.) Solve: \(\frac{-2|x + 4|}{5} \leq -6\)

7. (7 pts.) If Charles lost 20 pounds, he would weigh seven times as much as his pet boa constrictor. Together they weigh 200 pounds. How much does each weigh?

8. (7 pts.) Solve for \(z\): \(\frac{x}{3} = \frac{4y + 3z}{z}\)

9. (6 pts.) Let \(f\) be the function given by \(f(x) = \frac{x}{\sqrt{3-x}} + \frac{x^2 - 1}{2}\).

What is the domain of \(f\)?

10. (6 pts.) Let \(k\) be the function given by \(k(x) = \sqrt{x^2 - 3x + 6}\).

Find and simplify \(3k(1) + [k(-2)]^2\).
11. (7 pts.) Let \( f \) be the function given by \( f(x) = x^2 - x \).

Find and simplify \( f(3a) - f(a + 3) \).

12. (6 pts.) Find the equation of the line containing the points \( \left(\frac{1}{2}, 0\right) \) and \( \left(\frac{1}{2}, 3\right) \).

13. (6 pts.) Find the equation of the line that is perpendicular to the line \( 2x - 5y = 7 \) and passes through the point \((-1, 5)\).

14. (7 pts.) Three consecutive odd integers are such that twice the square of the first plus the square of the second is 39 less than twice the square of the third. Find all such integers.

15. (7 pts.) Solve, writing any non-real solutions in the form \( a + bi \): \( 12x^2 + 4x^4 = 8x^3 \)

16. (7 pts.) Graph, labeling the vertex and all \( x \) and \( y \) intercepts: \( g(x) = -2x^2 + 4x + 6 \)

17. (7 pts.) Simplify completely: \( \frac{7x}{x^2 - 3x - 10} - \frac{x}{x - 5} + 1 \)

18. (7 pts.) Let \( f \) be the function given by \( f(x) = \sqrt{3x} - \sqrt{x + 4} \). Find all inputs, \( x \), such that \( f(x) = 2 \).

19. (7 pts.) Solve: \( 5x^2 \leq x^3 \)

20. (7 pts.) Solve: \( \frac{x - 4}{x + 2} \geq 3 \)

21. (7 pts.) The graph of a function, \( f \), is shown here.

a) What is the domain of \( f \)?

b) What is the range of \( f \)?

c) What is \( f(-3) \)?

d) Find all \( x \) such that \( f(x) = 2 \).
22. (7 pts.) Solve: $x^3 + \frac{1}{x^6} - 6 = 0$

23. (6 pts.) Find: a) $\log_{\sqrt{10}} (10)$ b) $\log_5 (25)$ c) $\log_{11} (3)$

24. (6 pts.) Using the approximate values $\log_{11}(3) = 0.4$ and $\log_{11}(15) = 1.1$ find:
   a) $\log_{11}(5)$ b) $\log_{11}(33)$ c) $\log_{11}(27)$

25. (7 pts.) Let $f$ be the function given by $f(x) = \log_6 (x+3) + \log_6 (x+2) - \log_6 (20)$. Find all $x$ intercepts of the graph of $f$.

26. (7 pts.) Identify and sketch the curve given by $x^2 + y^2 + 2y = 8$.

27. (7 pts.) Arrange the following numbers in order from smallest to largest:
   $\sin(3.1)$ $\cos(3.1)$ $\cos(-\pi)$ $-\pi$

28. (6 pts.) Convert to radians:
   a. $160^\circ$
   b. $180^\circ\pi$

29. (6 pts.) For the right triangle shown here, find an exact value for:
   a. $\sin(\angle A)$
   b. $\cos(\angle A)$
   c. $\tan(\angle B)$

30. (7 pts.) My dog, Pooba, likes to swim in the river. Pooba can swim 6 miles per hour in still water.

   He can swim 6 miles upstream in the same time it takes to swim 18 miles downstream.

   What is the speed of the river’s current?