INSTRUCTIONS: Books, notes, and electronic devices are not permitted. The exam is worth 100 points. Simplify and box all your answers. Write neatly and show all work. A correct answer with incorrect or no supporting work may receive no credit.

Name: ___________________________ Instructor: ___________________________

1. (28 pts)
   (a) Multiply and simplify completely: \((x^2 + 1)^2\)

   (b) Simplify to write as a polynomial: \((6u - 3)(u + 1) - 2u(u + 3)\)

   (c) Simplify completely: \(\sqrt[3]{27x^4y^3}\)

   (d) Factor completely: \(2x^2 - 9x + 10\)

   (e) Simplify: \(\frac{x^{-3}y^2z^{1/2}}{z^{-1/2}}\)
(f) Combine into a single fraction: \( \frac{1}{2x} + \frac{2}{3x^2} \)

(g) Simplify the expression: \( \frac{1 + \frac{2}{x}}{\frac{4}{x} + 3} \)

2. Solve the following equations: (25 pts)
   
   (a) \( x^{3/2} = 64 \)

   (b) \( -3 + x + \sqrt{x + 3} = 0 \)
(c) $x^2 - 4x - 2 = 0$

(d) $|x - 1| = 2$

(e) Solve for $r$: \[4r = \frac{t^2}{r}\]

3. (12 pts)

(a) Plot the two points: $A(2, 3), B(-3, -2)$ on a graph. Label points and tick marks on graph.

(b) Find the distance between the two points.

(c) Find the midpoint between the two points.
4. Find the domain of the following functions. Give all answers in interval notation. (15 pts)

(a) \( f(x) = \sqrt{x^2 - 3x - 10} \)

(b) \( h(x) = \sqrt[3]{1 - x} \)

(c) \( g(x) = \frac{x - 4}{x^2 - 16} \)
5. Consider the graph of the function $f$ and answer the questions below. When appropriate give answers in interval notation. (10 pts)

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

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

(c) Find $f(1)$

(d) All $x$ such that $f(x) = 1$.

(e) All $x$ such that $f(x) \leq 1$.

6. Find an equation of a circle that satisfies center $C\left(-\frac{1}{2}, 2\right)$ and radius $r = 3\sqrt{2}$. (5 pts)

7. Sketch the graph of: $y = \sqrt{9 - x^2}$. Make sure to label tick marks on the axes. (5 pts)
Potentially useful equations:

(i) \( a^3 - b^3 = (a - b)(a^2 + ab + b^2) \)

(ii) \( a^3 + b^3 = (a + b)(a^2 - ab + b^2) \)

(iii) Difference quotient of \( f(x) \):
\[
\frac{f(x + h) - f(x)}{h}
\]