Name ________________________________

- Do not open this test until I say start.
- Turn off all electronic devices and put away all items except a pen/pencil and an eraser.
- No calculators allowed.
- You must show sufficient work to justify each answer.
- Quit working and close this test booklet when I say stop.
1. (6 points each) Simplify completely

(a) \( \frac{(2x^{-3}y^4z)^0}{6^{-1}x^3y}(6x^5y^{-2}z^{-1})^{-2} \)

(b) \( \frac{64^{-\frac{1}{2}}}{(\sqrt{63} + \sqrt{28})^2} \)

2. (6 points) Complete the square, giving your answer in the form \( a(x + b)^2 + c \):

\( 3x^2 - 12x + 7 \)
3. (10 points) Solve, giving your answer in interval notation:

\[ 2|2x + 3| + 4 > 6 \]

4. (8 points) Solve, giving all real solutions:

\[ 2 = \sqrt{2x + 31} + x \]
5. (6 points each) Given that \( f(x) = x(x + 1) \) and \( g(x) = -x^2 - 2|1 - x| \), find and simplify
   
   (a) \( 2g(-1) - g(2) \)

   (b) \( \frac{f(x + 1) - f(x)}{2} \)

6. (8 points) Let \( g \) be the function given by \( g(t) = \sqrt{6} - \frac{t^2 - 9}{\sqrt{t} + 9} \). What is the domain of \( g \)?
7. (12 points) Let $h$ be the function given by $h(x) = \frac{x + 12}{\sqrt[4]{x + 2}} - x$. What is the domain of $h$?

8. (10 points) Find the average rate of change of the function $q$ between $x_1 = -4$ and $x_2 = -1$, where $q$ is given by

$$q(x) = \begin{cases} 
  x^2 + 3x & x < 0 \\
  x^3 - x^2 + 2 & x \geq 0 
\end{cases}$$
9. (8 points) 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.

10. (6 points) If \( f(x) \) is an odd function and \( g(x) = 2f(x) - \sqrt[3]{x} \), is \( g(x) \) even, odd, or neither? (Justify your answer)
11. (8 points) Solve, giving all real solutions: \((x^2 + x)^2 - 8(x^2 + x) + 12 = 0\)

**Bonus** (5 points) Brian wants to make a rectangular box with no lid out of a rectangular piece of cardboard that is 15 inches by 9 inches by cutting equal squares from each corner and turning up the sides as shown in the picture. Let \(x\) be the length of the sides of the squares removed. Write the volume \(V\) of the box as a function of \(x\). (Volume of a rectangular box is area of the base times the height.)