**Precalculus**  
**NO CALCULATOR**  
**Midterm Review**

Name: _____________________  
Period: ___  
Date: ______________

**Directions:** Complete the following problems. Make sure to **SHOW ALL OF YOUR WORK** to receive full credit. Reduce, circle, and label all final answers.

1. Determine whether the function \( a(x) = x^2 - 2 \) is even, odd, or neither.

2. Graph each function below.
   
   a. \( a(x) = \sqrt{-x - 3} + 2 \)  
   
   b. \( b(x) = -(x + 1)^2 + 1 \)

   c. \( c(x) = -e^{x+2} + 3 \)  
   
   d. \( d(x) = -\ln(-x + 1) - 4 \)

3. Let \( f(x) = \frac{\sqrt{8-x}}{x^2-25} \) and \( g(x) = \sqrt{x^2 - 9} \). Calculate \( \left( \frac{f}{g} \right)(x) \) and \( \left( \frac{g}{f} \right)(x) \). State the domain of each in interval notation.

4. Let \( a(x) = \frac{1}{x-4} \) and \( b(x) = \sqrt{x - 2} \). Calculate \( a(b(x)) \) and state the domain in interval notation.
5. Calculate the inverse of the function \( g(x) = 3\sqrt{x + 4} + 1 \). State the domain of \( g^{-1}(x) \) in interval notation.

6. Sketch a graph of the function \( a(x) = 5x(x - 2)(x + 3)^2 \).

7. Graph each rational function below. Identify all asymptotes and intercepts.
   
   a. \( f(x) = \frac{3x^2 - 27}{x^2 - 1} \)  
   b. \( g(x) = \frac{x^2 - 4x - 12}{x + 2} \)

8. Convert each equation into standard form. Graph each function and identify key points/lines.
   
   a. \( -9x^2 - 25y^2 + 36x + 50y + 164 = 0 \)  
   b. \( x^2 + 8x - 4y - 4 = 0 \)
9. Write a rule that represents the \( n^{th} \) term of each series below. Then, use summation notation to represent the series.
   a. \( \sum_{n=1}^{\infty} 2 \left( \frac{3}{4} \right)^n \)  
   b. \( \sum_{n=1}^{9} \frac{1}{2} (3)^n \)

10. Calculate the sum of each sequence below.
   a. \( \sum_{n=1}^{\infty} 2 \left( \frac{3}{4} \right)^n \)  
   b. \( \sum_{n=1}^{9} \frac{1}{2} (3)^n \)  
   c. \( \sum_{n=1}^{46} -8n + 3 \)
11. Let \( A = \begin{bmatrix} 1 & 2 & 2 \\ 3 & 7 & 9 \\ -1 & -4 & -7 \end{bmatrix} \). Calculate \( A^2 \), \( A^{-1} \), and the determinant of \( A \) using minors & cofactors.

12. Solve the system of linear equation below using matrices.
\[
5x - 2y = -39; \quad -3x + 8y = 71
\]

13. Find any and all extrema of the function \( f(x) = -x^4 + 8x^2 - 3x + 4 \). Use a graphing calculator to sketch the graph. Determine over which intervals the function is increasing, decreasing, or neither.