1. (15 points) Consider the quadratic function \( g(x) = 2x^2 - 12x + 9 \).

(a) \( g(-2) = \)

(b) State the roots of this function in reduced radical form.

(c) State the \( y \)-intercept.

(d) Determine the vertex.

(e) Sketch the graph of this function.
2. (15 points) Let \( f(x) = \frac{x(x - 2)}{(x + 1)(x - 3)} \).

(a) Write the equations for the vertical asymptotes (poles).

(b) Write the equation for the horizontal asymptotes.

(c) Find the \( y \)-intercept

(d) Find the \( x \)-intercepts.

(e) Sketch the graph of this function.
3. (15 points) Solve each of these for $x$. Beware of domain restrictions.

(a) $\ln(x + 1) + \ln(x - 1) = \ln 3$

\[ 8 = 4e^{3x} \]

(c) $\log_2 \left( \frac{1}{64} \right) = x$
4. (8 points) Solve \[
\begin{align*}
\frac{x^2}{2} - y &= -3 \\
2x + y &= 18
\end{align*}
\]

5. (7 points) Determine all three roots of this equation, writing them in reduced radical form.

\[
x^3 + x^2 + x - 3 = 0.
\]
6. Let \( A = \begin{bmatrix} 1 & 1 & -5 \\ 1 & 0 & -2 \\ 2 & -1 & -4 \end{bmatrix}, \quad B = \begin{bmatrix} 3 & 5 \\ 2 & -4 \end{bmatrix}, \) and \( C = \begin{bmatrix} 2 \\ -3 \end{bmatrix}. \)

(a) Find the determinants of \( A \) and \( B \).

(b) Find the inverse of \( B \).

(c) Write a set of linear equations in \( x \) and \( y \) using matrices \( B \) and \( C \).

(d) Solve your system for \( x \) and \( y \).
7. (6 points) For the sequence, \( a_n = (-1)^n(3n - 2) \).

(a) Write the first five terms of this sequence.

\[
\sum_{j=1}^{5} a_j = \]

8. (4 points) Expand and write in decreasing powers of \( x \): \((2x - y)^4\).
9. (15 points) Let \( f(x) = \sqrt{6 - 5x} \), and let \( g(x) \) be the function in the graph:

Find these:

(a) \( f(-2) = \)

(b) \( g(3) = \)

(c) The \( x \)-intercepts of \( g(x) \) are

(d) The \( y \)-intercept of \( f(x) \) is

(e) \( g \circ f(-2) = \)

(f) Find the inverse of \( f(x) \), and state the domain of the inverse.