I) **Functional notation.** Given that \( f(x) = 3x^2 - 2x + 5 \) and \( g(x) = 3x - 1 \), find each of the following:

1) \( g(4) - f(-2) \)
2) \( g(x + h) - g(x) \)
3) \( g \circ f(x) \)
4) \( g^{-1}(x) \)

II) **Linear inequalities in one variable.** Solve. Graph on a number line and write in interval notation.

1) \( 3(x - 4) - (x + 1) \leq x - 12 \)

III) **Exponents and polynomials.** Simplify. Write all answers with positive exponents.

1) \( (3x - 5)^4 \)
2) \( (4x^2y^6z)^2 (-x^5y^7z^8)^6 \)
3) \( \frac{4x^4 - 4x^3 + 3x^2 - 5x + 2}{2x - 3} \)

IV) **Complex Numbers.** Simplify.

1) \( \sqrt{-25} \sqrt{-81} \)
2) \( \frac{3 - 4i}{6 + 2i} \)
3) \( (5 + 2i)(-3 - 5i) \)
V) **Equations and inequalities in two variables.** Graph on a coordinate system. Identify the intercepts and the slope of the linear equation.

1) \[ y = \frac{-3}{4}x - 2 \]

2) Solve the system:
   \[
   \begin{align*}
   2x - 2y - z &= -1 \\
   x + 2y + 2z &= 9 \\
   x + y - z &= 8
   \end{align*}
   \]

VI) **Quadratic equations and functions.** Graph on a coordinate system. Identify the coordinates of the vertex and the intercepts.

1) \[ g(x) = -(x + 1)^2 - 2 \]

VII) **Rational functions and expressions.**

1) Find the domain of
\[
  f(a) = \frac{a^2 + 2a - 3}{3a^2 + 11a + 6}
\]
2) Solve:

\[
\frac{3p}{p^2 + 5p + 6} = \frac{5p}{p^2 + 2p - 3} - \frac{2}{p^2 + p - 2}
\]

VIII) Logarithms and exponentials.

1) Condense into a single log and simplify: \(\log(10) - \log(5)\)

2) Expand into sums, differences, and products.

\[\log\left(\frac{abc^3}{d^2}\right)\]

3) Solve:

a) \(\ln x + \ln(2x + 1) = 0\)

b) \(9^x = 27\)

4) Graph:

a) \(g(x) = \log_2(x - 2)\)

b) \(p(x) = 2^x - 1\)
IX) **Miscellaneous graphing.** Graph on a coordinate system.

1) \( x^2 + y^2 = 4 \)
2) 
\[
\begin{align*}
    f(x) &= \sqrt{x + 2} \\
    \text{for } x &\geq -2
\end{align*}
\]

3) \( f(x) = |x - 3| - 1 \)

X) **Polynomial functions.**

1) Find all zeros of the function: \( f(x) = -2x^4 + 13x^3 - 21x^2 + 2x + 8 \)

XI) **Matrices and determinants.**

1) Evaluate the determinant of

\[
\begin{vmatrix}
3 & 4 \\
2 & 5
\end{vmatrix}
\]
XII) Sequences and series.

1) Write the first five terms of the arithmetic sequence
   \[ A_1 = 6, \quad A_{k+1} = A_k - 5 \]

2) Find the \(n^{\text{th}}\) partial sum of the arithmetic sequence
   \[ 8, 20, 32, 44, \ldots \quad n = 10 \]

3) Write the first five terms of the geometric sequence
   \[ a_1 = 1, \quad r = \frac{1}{3} \]

3) Find the given sum. Round your answer to the nearest tenth.
   \[ \sum_{k=1}^{10} 8 \left( \frac{-1}{4} \right)^{k-1} \]

XIII) Trigonometry.

1) Find the indicated values.
   a) \(\sin 30^\circ = \ldots\)
   b) \(\cos 45^\circ = \ldots\)
   c) \(60^\circ = \ldots\) radians
   d) \(\pi\) radians = \(\ldots^\circ\)
   e) in quadrant IV, if \(\cos x = 4/5\), then \(\sin x = \ldots\)
   f) in quadrant III, if \(\tan x = 3/4\), then \(\cos x = \ldots\)
   g) \(\sin(2\pi/3) = \ldots\)
   h) \(\cos(\pi/2) = \ldots\)
   i) if \(\tan x = 5/6\), then \(\cot x = \ldots\)
   j) \(\tan (\pi/3) = \ldots\)
2) Graph on a coordinate system.

a) \( f(x) = \sin x \)

\[ \text{Graph of } f(x) = \sin x \]

b) \( f(x) = \cos x \)

\[ \text{Graph of } f(x) = \cos x \]