Below you will find 8 problems, with their maximum scores. Solve the problems in the space provided. When writing a solution to a problem, **show all work**. No books or notes are allowed.

**Problem 1 (8 points).** (a) Write the set \( \{ x \mid -2 \leq x < 1 \} \) in interval notation, then graph the interval on the number line.

(b) Write the interval notation for the graph:

\[
\begin{array}{cccccccc}
-6 & -5 & -4 & -3 & -2 & -1 & 0 & 1 & 2 & 3 & 4 & 5 & 6 \\
\end{array}
\]

**Problem 2 (8 points).** Rationalize the denominator in \( \frac{1 + 2\sqrt{3}}{2 - \sqrt{3}} \), then simplify.
Problem 3 (8 points). Simplify \( \frac{16x^7 y^{-2}}{8x^3 y^{-7}} \).

Problem 4 (24 points). Perform the indicated operations and simplify.
(a) \((x^4 - 5x^3 + 7x) - (2x^3 + 4x^2 - 3x - 2)\).

(b) \((x^2 - 2x - 1)(2x - 3)\).

(c) \((3x^2 - 2y)^2\).
Problem 5 (28 points). Factor the following polynomials completely:

(a) \( x^3 - 2x^2 - 4x + 8 \)

(b) \( 36x^2 - 60x + 25 \)

(c) \( 25x^2 - 4 \)

(d) \( 4x^2 + 4x - 3 \).
Problem 6 (8 points). Assume both $x$ and $y$ are positive. Simplify \( \left( \frac{8x^2 y^{5/6}}{x^{-1} y^{-1/6}} \right)^{1/3} \), then convert to radical notation.

Problem 7 (8 points). Find the domain of \( \frac{8x^2 - 5}{x^2 + x - 6} \).

Problem 8 (8 points). Perform the indicated operation, then simplify.

\[ \frac{5}{y^2 - y - 6} - \frac{1}{y - 3}. \]