1. (5 points) Simplify the expression and eliminate any negative exponents. Assume that all letters denote positive real numbers.

\[ \left( \frac{6a^{10}b^{-8}}{3a^6b^{-3}} \right)^3 \]

(a) \( x^3 - 4x^2 - 5x + 20 \)

2. (10 points) Simplify the compound fraction.

\[ \frac{a - b}{\frac{1}{a} - \frac{1}{b}} \]

(b) \( m^3 - 125 \)

(c) \( 7x^{-1/2} + 8x^{1/2} + x^{3/2} \)

3. (15 points) Factor completely (over the real numbers).

(a) \( x^3 - 4x^2 - 5x + 20 \)

(b) \( m^3 - 125 \)

(c) \( 7x^{-1/2} + 8x^{1/2} + x^{3/2} \)
4. (10 points) Solve using the Quadratic Formula. Give exact answers, simplified.

\[3x^2 + 2x = 7\]

5. (10 points) Solve algebraically. Identify all extraneous solutions.

\[5 + \sqrt{x + 7} = x\]

6. (10 points) Rationalize the numerator and simplify.

\[\frac{\sqrt{x} + \sqrt{y}}{x - y}\]

7. (5 points) Find an equation of the line through \(\left(\frac{1}{2}, -1\right)\) and perpendicular to the line \(3x - 2y + 7 = 0\). Express it in the form \(y = mx + b\).
8. (5 points) Use Pascal’s Triangle to expand. Then simplify your answer.

\[(2x - y)^6\]

9. (10 points) Solve the system of equations. Express solutions as ordered pairs \((x, y)\).

\[
\begin{align*}
2y + 42x &= 5 \\
4y + 7x &= -1
\end{align*}
\]

10. (10 points) The owner of a store sells raisins for $1.75 per pound and nuts for $5.50 per pound. He decides to mix nuts and raisins and sell 10 pounds of the mixture for $4.00 per pound. What quantities raisins and nuts should he use? Introduce your variables with “Let” statements. Draw and label a diagram. Set up and solve an equation. State your answer in a complete sentence.
11. (10 points) Solve the inequality algebraically. Show all work, including the sign chart (or other approved method), clearly. Give your solution set in interval notation.

\[
\frac{2 - x}{3x + 1} \leq 0
\]

12. (10 points) Determine algebraically if the equation \( x^2 + y^2 + 4x - 20y - 40 = 0 \) represents a circle. If so, find the center and radius.