1. Solve the following equations:

(a) \( 3 = \frac{4x}{2x + 1} \)

(b) \( x^2 = 5x - 6 \)

(c) \( 4x = (x + 1)^2 \)

(d) \( (\sqrt{x} + 1)^2 = x + 7 \)
2. Solve the following equation for $a$:

$$\frac{3a + 4b}{2a - 5} = b$$

3. Solve the following equations:

(a) $x - \frac{1}{x} = 0$

(b) $\frac{x - 2}{x + 1} - \frac{1}{x - 3} = 0$
4. Find all solutions to the following system of equations

\[
\begin{align*}
2x - 3y &= 5 \\
3x - 8y &= 4
\end{align*}
\]

5. Find all solutions to the following system of equations:

\[
\begin{align*}
3x + y &= 5 \\
x^2 + 2y &= 1
\end{align*}
\]
6. Rationalize either the top or the bottom of the following fractions:

(a) \( \frac{5}{\sqrt{3} - 1} \)

(b) \( \frac{x - \sqrt{5}}{x + 3} \)

(c) \( \frac{x - 4}{\sqrt{x} + 2} \)
7. Simplify:

\[
\frac{1}{x} + \frac{1}{x^2} + \frac{1}{x^3}
\]

\[
\frac{1}{x^4} + \frac{1}{x^5} + \frac{1}{x^6}
\]

*Hint:* The answer is \(x^3\).
8. Show that the following is true for all $x$ and $y$ with $x \neq y$:

$$\frac{y}{x} - \frac{x}{y} - \frac{1}{y} + \frac{1}{x} = -x - y$$