Factor the following quadratic trinomials

1. $15x^2 + 121x + 8$

2. $15x^2 - 29x + 8$

3. $15x^2 + 43x + 8$

4. $15x^2 - 14x - 8$

5. $15x^2 - 19x - 8$

6. $15x^2 + 119x - 8$

7. $15x^2 + 26x - 8$

8. $15x^2 - 26x + 8$

9. $15x^2 - 2x - 8$

10. $15x^2 + 37x - 8$

11. $15x^2 - 34x + 8$

12. $15x^2 + 22x + 8$
A LITTLE EXPLORATION

Select a variety of positive integer values for $m$ and $n$ with $m > n$ and fill in the chart below. Look at the values you get. Is there any sort of pattern? What are these sets of numbers? Can you prove it?

<table>
<thead>
<tr>
<th>$m$</th>
<th>$n$</th>
<th>$m^2 - n^2$</th>
<th>$2mn$</th>
<th>$m^2 + n^2$</th>
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Now check out these sets of values. Is there any sort of interesting relationship/pattern? Can you find any other sets?

1, 2, 2, 3
1, 4, 8, 9
2, 3, 6, 7
2, 6, 9, 11
3, 4, 12, 13
6, 6, 7, 11
ASYMPTOTES VERSUS HOLES

Use your grapher (set the x-min value to -4.7 and the x-max value to 4.7) to investigate the graphs of the following rational functions. At which values for $x$ do you expect to find vertical asymptotes? Why? Why do some of the $x$-values at which you would expect to see an asymptote fail to have this feature? What peculiar graphical occurrence do you find there?

1. $f(x) = \frac{x^2 + 1}{x + 1}$
2. $f(x) = \frac{x + 1}{x^2 - 1}$
3. $f(x) = \frac{x^2 - 1}{x + 1}$
4. $f(x) = \frac{x^3 + 1}{x + 1}$
5. $f(x) = \frac{x + 1}{x^2 - 1}$
6. $f(x) = \frac{x^3 - 1}{x^2 - 1}$
7. $f(x) = \frac{x - 1}{x^2 - 1}$
8. $f(x) = \frac{x^3 + 1}{x^2 - 1}$
9. $f(x) = \frac{x^2 - 1}{x - 1}$
10. $f(x) = \frac{x^3 - 1}{x - 1}$
11. $f(x) = \frac{x^2 - 1}{x^2 + 1}$
SO YOU THINK YOU CAN SOLVE SYSTEMS OF EQUATIONS!

Solve for \((x, y)\) in each of the following systems. Give a complete set of ordered pairs that form the solution. In some of these you should try to find a “clever” approach.

1. \[
\begin{align*}
\frac{9}{2x} + \frac{10}{3y} &= \frac{15}{12} \\
\frac{7}{2x} - \frac{5}{3y} &= \frac{1}{4}
\end{align*}
\]

2. \[
\begin{align*}
\frac{3}{2x} + \frac{1}{y} &= \frac{13}{12} \\
\frac{1}{3x} - \frac{4}{3y} &= \frac{5}{18}
\end{align*}
\]

3. \[
\begin{align*}
ax &= 6y - 8 \\
by &= x + 1
\end{align*}
\]

4. \[
\begin{align*}
mx + ny &= m^2 + n^2 \\
my - nx &= m^2 + n^2
\end{align*}
\]

5. \[
\begin{align*}
\frac{x - 1}{3} - \frac{y - 2}{4} &= 1 \\
\frac{x - 2}{4} + \frac{y - 1}{3} &= 2
\end{align*}
\]

6. \[
\begin{align*}
\frac{2x + y + 5}{7x + 6y} &= \frac{1}{6} \\
\frac{x + y - 2}{2y - x + 4} &= \frac{1}{8}
\end{align*}
\]

7. \[
\begin{align*}
x - 2y &= 12 \\
x + y &= -10
\end{align*}
\]

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