1. \[21x^5y^2 + 35x^4y^3 - 14x^3y^5\]
   \[= 7x^3y(3x + 5xy - 2y^3)\]

2. \[x^3 + 4x - 1 \times -24\]
   \[= x^3(x + 4) - 6(x + 4)\]
   \[= (x + 4)(x^2 - 6)\]

3. \[x^2 - 11xy + 28y^2\]
   \[= (x - 7y)(x - 4y)\]

4. \[2x^2 + 12x - 54\]
   \[= 2(x^2 + 6x - 27)\]
   \[= 2(x - 3)(x + 9)\]

5. \[8y^4 - 10y - 3\]
   \[= (2y^4 - 1)(4y^3 + 1)\]
   \[= (2y - 3)(4y + 1)\]
$6x^2 + 19x - 7$

\[
4x^2 + 36x + 81
= (2x + 9)(2x + 9)
= (2x + 9)^2
\]

13. $25y^2 - 81$
\[
= (5y + 9)(5y - 9)
\]

14. $4x^4 - 49y^2$
\[
= (2x^2 + 7y)(2x^2 - 7y)
\]

15. $625x^3 + 135y^3$
\[
= 5(125y^3 + 27y^3)
= 5(5x + 3y)(25x^2 - 15xy + 9y^2)$
Solving Quadratic Equation

1. Factoring  
   Ex.  \(25x^2 = 81\)
   \[25x^2 - 81 = 0\]
   \[(5x - 9)(5x + 9) = 0\]
   \[5x - 9 = 0\] or \[5x + 9 = 0\]
   \[x = \frac{9}{5}\] or \[x = -\frac{9}{5}\]
   \[\left\{-\frac{9}{5}, \frac{9}{5}\right\}\]

2. Square Root Property: for any complex number \(k\)

   \[x = \pm \sqrt{k}\]

   Solve by square root property.

   \[25x^2 = 81\]
   \[\frac{25x^2}{25} = \frac{81}{25}\]
   \[x^2 = \frac{81}{25}\]
   \[x = \pm \sqrt{\frac{81}{25}}\]
   \[x = \pm \frac{9}{5}\]

   Solve \(x^2 = -9\) where \(x\) is a real number.

   \[x = \pm 3i\]

   \[i = \sqrt{-1}\]

   No real solution.
(3) Completing the square \((5x-9)(5x+9) = 0\)

(4) Quadratic formula, \(5x-9=0\) or \(5x+9=0\)

\[ x = \frac{9}{5} \quad \text{or} \quad x = -\frac{9}{5} \]

\[ \left\{ -\frac{9}{5}, \frac{9}{5} \right\} \]

Solve by root prop.

\[(x+5)^2 = 36 \]

\[ \sqrt{(x+5)^2} = \pm \sqrt{36} \]

\[ x+5 = \pm 6 \]

\[ x = -5 \pm 6 \]

\[ x = -5+6 \quad \text{or} \quad x = -5-6 \]

\[ x = 1 \quad \text{or} \quad x = -11 \]

To solve \(ax^2 + bx + c = 0\) where, \(a \neq 0\)

by completing the square

1. Make sure that \(a = 1\)

\[ a \frac{x^2}{a} + b \frac{x}{a} + c \frac{1}{a} = 0 \]

\[ x^2 + \frac{b}{a}x + \frac{c}{a} = 0 \]
2. Arrange so that variable terms are on one side and constant terms on other.

\[ x^2 + \frac{b}{a}x + \frac{c}{4a} = \frac{-4ac}{4a} + \frac{b}{4a} \]

3. Factor \( \sqrt{x + \frac{b}{2a}} = \pm \sqrt{-4ac + b^2} \)

4. \( x + \frac{b}{2a} = \pm \sqrt{\frac{b^2 - 4ac}{4a^2}} \)

5. \( x = \frac{-b}{2a} \pm \frac{\sqrt{b^2 - 4ac}}{2a} \)

6. \( x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \)

Solve this by completing the square.

\[ x^2 - 6x + 13 = 0 \]

\[ x^2 - 6x + 9 = -13 + 9 \]

\[ \sqrt{(x-3)^2} = \pm \sqrt{4} \]

\[ x - 3 = \pm 2i \]

\[ x = 3 \pm 2i \]
Use quad formula to solve.

\[ 6x^2 + 19x - 7 = 0 \]

\[
\begin{align*}
  x &= \frac{-19 \pm \sqrt{(19)^2 - 4(6)(-7)}}{2(6)} \\
  &= \frac{-19 \pm \sqrt{361 + 168}}{12} \\
  &= \frac{-19 \pm \sqrt{529}}{12} \\
  &= \frac{-19 \pm 23}{12} \\
  x &= \frac{-19 + 23}{12} \quad \text{or} \quad x = \frac{-19 - 23}{12} \\
  &= \frac{4}{12} = \frac{1}{3} \\
  &= \frac{-412}{12} = -\frac{7}{2}
\end{align*}
\]

\[ ax^2 + bx + c \]

Quadratic Formula

\[
\begin{align*}
  x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\
  \text{Discriminant} \\
  b^2 - 4ac \\
  - \text{If this is greater than zero and a perfect square, you have two rational solutions.} \\
  - \text{If this is greater than zero and not a perfect square, there are two irrational solutions.} \\
  - \text{If this equals zero, you have one rational solution.} \\
  - \text{If this is negative, there are two imaginary solutions.}
\end{align*}
\]