(1) \( 4a^4 - 12a^3 + 10a^2 \)
\[ = 2a^2(2a^2 - 6a + 5) \]
* first thing to try in factoring is a common factor.
* each term has at least \( 2a^2 \)
* always check your work by multiplying out your answer and see if you get what you started with.

(2) \( 3a(2a+3) - 5(2a+3) \)
\[ = (3a - 5)(2a + 3) \]
* factoring by grouping also has this step.

(3) \( 15x^2 - 3x \)
\[ = 3x(5x - 1) \]

(4) \( 35x^3 + 14x^2 - 49x \)
\[ = 7x(5x^2 + 2x - 7) \]
\[ = 7x(5x + 7)(x - 1) \]
\[ = \frac{5x^2 - 63x - 7}{5x^3 + 17x - 7} \]

(5) \( x^2 - 49 \)
\[ = (x + 7)(x - 7) \]
(6) \(4x^2 - 25\)
    \[= (2x + 5)(2x - 5)\]

(7) \(9x^2 - 100\)
    \[= (3x + 10)(3x - 10)\]

(8) \(16x^2 + 49\)
    ∆ the sum of two squares is prime
    (cannot be factored anymore)

(9) \(x^3 - 2x^2 + 3x - 6\)
    \[= x^2(x - 2) + 3(x - 2)\]
    \[= (x^2 + 3)(x - 2)\]

(10) \(6x^3 + 10x^2 - 21x - 35\)
    \[= 2x^2(3x + 5) - 7(3x + 5)\]
    \[= (2x^2 - 7)(3x + 5)\]
(11) \(10x^3 + 12x^2 - 15x - 18\)
\[= 2x^2(5x+6) - 3(5x+6)\]
\[= (2x^2 - 3)(5x+6)\]

(12) \(x^3 - 27\)
\[= (x-3)(x^2 + 3x + 9)\]

(13) \(8x^3 + 125\)
\[= (2x+5)((2x)^2 - 2x \cdot 5 + 5^2)\]
\[= (2x+5)(4x^2 - 10x + 25)\]

(14) \(x^2 + 12x + 35\)
\[= (x+5)(x+7)\]

(15) \(x^2 - 2x - 35\)
\[= (x-7)(x+5)\]

- The difference & sum of cubes both can be factored into a binomial multiplied by a trinomial.

- \(a^3 - b^3 = (a-b)(a^2 + ab + b^2)\)
- \(a^3 + b^3 = (a+b)(a^2 - ab + b^2)\)

- The sign in the last term is positive means you have the same signs in the binomials, if it's negative, signs in the binomials are different.
- What two number multiply to get the last number and add to get the second number.
\( x^2 - 12x + 35 \)
\[ = (x - 5)(x - 7) \]

\( x^2 - 5x - 24 \)
\[ = (x - 8)(x + 3) \]

\( x^2 + 10x - 24 \)
\[ = (x - 4)(x + 6) \]
\[ = (x + 12)(x - 2) \]