Factoring Rules

<table>
<tr><td>1st</td><td>Do This First:</td><td colspan="3">Divide out common factors.

$3x^4 + 12x^3 - 9x = 3x\,(x^3 + 4x^2 - 3)$</td></tr>
<tr><td rowspan="3">2nd</td><td rowspan="3">Second:

How many terms does it have?</td><td>2 terms</td><td>3 terms</td><td>4 terms</td></tr>
<tr><td rowspan="2">Difference of two squares
$a^2 - b^2 = (a + b)\,(a - b)$

Sum of two squares
$a^2 + b^2$ = Prime = Can’t factor

Difference of two cubes
$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

Sum of two cubes
$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$</td><td>$x^2$ in front:
a. Write (x   ) (x   ).

b. Find two numbers that multiply to make the back number and add to make the middle.</td><td rowspan="2">a. Chop the problem in half.
b. Factor the front two terms.
Factor the back two terms.</td></tr>
<tr><td>Number in front: Split the middle.
a. Multiply front and back coefficients.
b. Find factors of the answer that add to make the middle.
c. Split it and chop the problem in half.
d. Factor the front terms. Factor the back terms.</td></tr>
<tr><td>3rd</td><td>Third:</td><td colspan="3">Look inside factors that have parentheses.
If there is a square or higher power, see if the term can be factored.</td></tr>
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