

Chapter 6	Systems of Equations and Inequalities
Section 5	Partial Fractions

Finding partial fractions is the reverse of combining terms over a common denominator.

Starting with a single fraction, break it up into the sum of several fractions.

1. Factor the denominator as completely as possible.
2. Each unique factor becomes the denominator in a term. If you have two factors, make two terms. If you have three factors, make three terms.

If a factor is repeated (the factor is raised to an exponent), then create as many terms as the size of the exponent. The first term will have the factor raised to the first power, the second term will have the factor raised to the second power, and so on.

3. Generate the numerators for each term. This is the tricky part. The rules are:
 1. Use capital letters, starting with A, to generate the numerators.
 2. If the denominator is linear, whether repeated or not (ie: squared, cubed, etc), the numerator will be one term: a constant. Example: A.
 3. If the denominator is quadratic, whether repeated or not (ie: squared, cubed, etc), the numerator will be two terms: a coefficient times the variable plus a constant. Example: $Ax+B$.
 4. For each new term in a numerator, use the next capital letter.
4. Set the original rational function equal to the sum of the new terms.
5. Multiply both sides of the equation by the common denominator.
6. On the right side of the equation:
 1. Clear all parentheses.
 2. Group together like terms.
 3. Factor out the common power of x from each grouping.
 4. The part inside the parentheses is the coefficient for that power of x.
7. Create a system of equations by taking the coefficients of the matching powers of x from both sides of the equation and setting them equal to each other.

Note: If a power of x is missing on one side, then set the existing coefficient equal to 0.

8. Solve the system of equations.
9. Plug the results from step 8 into the fractional terms created at the end of step 3.