

# MA 16020 LESSONS 6 + 7: PARTIAL FRACTIONS

## METHOD OF DECOMPOSING INTO PARTIAL FRACTIONS

Given a rational function  $\frac{N(x)}{D(x)}$

1. Factor the denominator as much as possible.

2. Write the fraction into decomposition form.

a) Distinct linear terms like  $x - a$  decompose to

$$\frac{A}{x - a}$$

b) Repeated linear terms like  $(x - a)^3$  decompose to

$$\frac{A}{x - a} + \frac{B}{(x - a)^2} + \frac{C}{(x - a)^3}$$

c) Distinct irreducible quadratic terms like  $x^2 + a^2$  decompose to

$$\frac{Ax + B}{x^2 + a^2}$$

d) Repeated irreducible quadratic terms like  $(x^2 + a^2)^2$  decompose to

$$\frac{Ax + B}{x^2 + a^2} + \frac{Cx + D}{(x^2 + a^2)^2}$$

3. Combine your decomposition from (2) as 1 fraction.

4. Set the original numerator,  $N(x)$ , equal to the numerator from (3).

5. Equate the coefficients of the terms, to yield a system of equations. Then solve the constants.

i.e. Find  $A, B, C, \dots$

6. Plug the values found in (5) in (2).