

Lecture 15 (3/4/2019)

Partial fraction decomposition

Review:

$$\int \frac{x^4 + 2x^3 + 2x^2 + x + 1}{x^2 - 2x + 1} dx$$

Long division:

$$\begin{array}{r} x^2 + 4x + 9 \leftarrow \text{quotient} \\ x^2 - 2x + 1 \overline{) x^4 + 2x^3 + 2x^2 + x + 1} \leftarrow \text{dividend} \\ \underline{- x^4 - 2x^3 + x^2} \\ 4x^3 + x^2 + x \\ \underline{- 4x^3 - 8x^2 + 4x} \\ 9x^2 - 3x + 1 \\ \underline{- 9x^2 - 18x + 9} \\ 15x - 8 \leftarrow \text{remainder} \end{array}$$

divisor

Therefore,

$$\frac{x^4 + 2x^3 + 2x^2 + x + 1}{x^2 - 2x + 1} = x^2 + 4x + 9 + \frac{15x - 8}{x^2 - 2x + 1}$$

$$\frac{15x - 8}{x^2 - 2x + 1} = \frac{A}{x - 1} + \frac{B}{(x - 1)^2}$$