# Chapter 6

October 22, 2025

## 0.1 Cauchy-Euler Equation

REFER TO NOTEBOOK.

**Case 2**

Given,

$$m = m_1, m_2 \text{ (Real)}$$

$$y_1 = x^{m_1} \qquad\qquad y_2 = x^{m_1} \cdot \ln x$$

### 0.1.1 Case 3

What if we have complex answers?

$$m = \alpha \pm i\beta$$
$$m_1 = \alpha + i\beta,\ m_2 = \alpha - i\beta$$

$$\begin{aligned} y &= c_1 x^{\alpha+i\beta} + c_2 x^{\alpha-i\beta} \\ &= c_1 x^{\alpha} \cdot x^{i\beta} + c_2 x^{\alpha} \cdot x^{i\beta} \end{aligned}$$