

$$P_1 = -x + 1$$

$$P_2 = x + 2$$

$$P_3 = x^2 + 1$$

Write $x^2 + 2x$ as a linear combination of P_1, P_2, P_3

In other words,

$$x^2 + 2x = \alpha P_1 + \beta P_2 + \gamma P_3$$

Solve for α, β, γ

Hint: \mathbb{R}^3 is isomorphic to \mathbb{P}_2 . Use linear algebra to solve. First, show $\{P_1, P_2, P_3\}$ forms a basis for \mathbb{P}_2 .

Also note, \mathbb{P}_2 is the set of polynomials with, at most, degree of two.

\mathbb{R}^3 is the set of real numbers in three dimensions.