

# Practice Problems

## MATH2055: Advanced Linear Algebra Tutorial 7

### Change of Basis

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## Question 1 - Change of Basis for Polynomials

Find the coordinate vector for  $p(t) = 4 - 3t + t^2$  relative to the basis  $B = \{1 + x, 1 + x^2, x + x^2\}$ .

## Question 2 - Change-of-Basis Matrix for Polynomials

(Treil 2.8.3) Find the change-of-basis matrix that changes the basis  $A = \{1, 1 + t\}$  in  $\mathbb{P}_1$  to the basis  $B = \{1 - t, 2t\}$ .

## Question 3 - Commutative Diagrams

Consider the following linear transformation:

$$T : \mathbb{P}_2 \rightarrow \mathbb{P}_3$$

$$T : a + bt + ct^2 \mapsto (2a + c) + (a + b + 3c)t + (b + 2c)t^2 + (a + c)t^3$$

Let  $A = \{1, 1 - t, t^2\}$  be a basis for  $\mathbb{P}_2$  and  $B = \{1, t, 1 - t^2, 1 + t^3\}$  be a basis for  $\mathbb{P}_3$ . Write the appropriate commutative diagram. Find  $[I]_{S \leftarrow A}$ ,  $[T]_{S \leftarrow S}$  and  $[I]_{B \leftarrow S}$ . Multiply to find  $[T]_{A \leftarrow B}$ .