SI 11/9/2022 Wed

Define: $T: P_2 \to \mathbb{R}$ by $T(p) = \int_0^1 p(x)\,dx$

what is kernal of T ?

$T(V_1, V_2) = (\frac{\sqrt{3}}{2} V_1 - \frac{1}{2} V_2, V_1 - V_2, V_2)$

$v = (2,4)$, $w = (\sqrt{3}, 2, 0)$

a.) the image of v

b.) the pre image of w

the image of v $= (\frac{\sqrt{3}}{2}(2) - \frac{1}{2}(4), 2-4, 4)$

$= (\sqrt{3} - 2, -2, 4)$

the preimage of w = $\sqrt{3} = \frac{\sqrt{3}}{2} V_1 - \frac{1}{2} V_{12}$

$2 = V_1 - V_2$

$0 = V_2$

$T(1,1) = (3,5)$

$T(1,-1) = (7,9)$

find $T(4,4)$

$$\begin{vmatrix} 1 & 1 \\ 1 & -1 \end{vmatrix} = -2 \neq 0$$

$\therefore$ It is a basis

$(4,4) = C_1(1,1) + C_2(1,-1)$

$(C_1, C_1) + (C_2, -C_2) = (4,4)$

$(C_1 + C_2, C_1 - C_2) = (4,4)$

$$\begin{matrix} C_1 + C_2 = 4 \\ C_1 - C_2 = 4 \end{matrix} = \begin{bmatrix} 1 & 1 & 4 \\ 1 & -1 & 4 \end{bmatrix} \xrightarrow{RREF} \begin{bmatrix} 1 & 0 & 4 \\ 0 & 1 & 0 \end{bmatrix}$$

$(4,4) = 4(1,1) + 0(1,-1)$

$T(4,4) = T(4(1,1) + 0(1,-1))$

$= 4T(1,1) + 0T(1,-1))$

$= 4(3,5) + 0$

$= (12, 20)$

$T : P_2 \to P_1$ be defined by $T(f) = f'$

find a) $\ker T$ b) $\operatorname{Rng} T$