

Consultation is fine, but no electronics, please.

- (1) (10 points) The linear transformation  $T : \mathbb{P}_1 \rightarrow \mathbb{P}_1$  is defined by  $T(p(x)) = \frac{d}{dx}p(x) + p(1)x$ . Find the eigenvalues and eigenspaces of  $T$ . (Do not convert  $T$  into a matrix.)

TURN OVER FOR MORE! More! more.

(2) (10 points) A linear transformation  $T : \mathbb{P}_1 \rightarrow \mathbb{P}_1$  has matrix  $\begin{bmatrix} 0 & 2 \\ 2 & 1 \end{bmatrix}$  with respect to the basis  $\mathcal{C} = \{1 - x, 3 + x\}$ . Find the value of  $T(2x)$ .