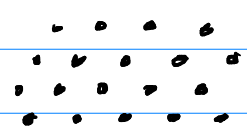


## Discussion - Oct 10

- For  $\mathcal{B} = (1+x \quad 1-x)$ , what is the coordinate rel.  $\mathcal{B}$  of a) 1 b)  $x$  c)  $2x+1$ ?  
d) is  $\mathcal{B}$  a basis of  $\mathbb{P}_1$ ?
- What is the coordinate vector of  $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$  from your point of view when you've rotated your head  $45^\circ$  counterclockwise?
- What is the matrix of  $T(\vec{x}) = \begin{bmatrix} 2x_1 \\ x_2 \end{bmatrix}$  from the same point of view as in 2?
- The triangular lattice in  $\mathbb{R}^2$  looks like  and models the packing of marbles in a tray.  
(a) What is a basis for it?  
(b) The lattice has  $60^\circ$  rotational symmetry. What is the matrix of  $60^\circ$  rotation relative to the basis in (a)?  
(c) What other symmetries does the lattice have? Do linear transformations fail us?
- For  $T: \mathbb{P}_2 \rightarrow \mathbb{P}_3$  defined by multiplication by  $(x-2)$ ,  
(a) What is the matrix of  $T$  relative to the standard polynomial bases?  
(b) Compute  $T(x+2)$  by (i) definition (ii) the matrix in (a)  
(c) Compute  $\text{im } T$  and  $\text{ker } T$  using the matrix.  
(d) is  $T$  surjective and/or injective? (e)  $\text{rank } T = ?$
- $T: \mathbb{P}_1 \rightarrow \mathbb{R}^2$  def. by  $T(p(x)) = \begin{bmatrix} p(1) \\ p(2) \end{bmatrix}$   
 $\mathcal{B} = (1 \quad x)$   $\mathcal{C} = \left( \begin{bmatrix} 1 \\ 1 \end{bmatrix} \quad \begin{bmatrix} 1 \\ 2 \end{bmatrix} \right)$ . Matrix of  $T$  rel. these?
- $T(\vec{x}) = \begin{pmatrix} 2 & 1 \\ 1 & 2 \end{pmatrix} \vec{x}$ . Can you find a basis in which  $T$ 's matrix is diagonal?