(11) Consider $u = (1,1,1)$ $v = (1,2,-3)$ and $w = (1,-4,3)$ which vectors are orthogonal

orthogonal vectors $= \bar{u}\cdot\bar{v} = 0$

$u\cdot v = (1,1,1)\cdot(1,2,-3)$

$= 1+2-3 = 0$

$=$ ~~u&v are~~ $\bar{u}$ & $\bar{v}$ orthogonal

$u\cdot w = (1,1,1)\cdot(1,-4,3)$

$= 1-4+3$

$= 0$

$\bar{u}$ & $\bar{w}$ are orthogonal

$v\cdot w = (1,2,-3)\cdot(1,-4,3)$

$= 1-8-9$

$\neq 0$

v & w are not orthogonal

(IX) Consider the vector

$U = (1, -5, 3)$

Find $||U||_1 = ?$, $||U||_2$, $||U||_\infty$

$||U||_1$ (first norm) $= \sum_{i=1}^{n} x_i$

$= 1 - 5 + 3$

$= -1$

$||U||_2$ (2nd norm) $= \left[\sum_{i=1}^{n} (x_i)^2 \right]^{\frac{1}{2}}$

$= \sqrt{1^2 + 5^2 + 3^2}$

$= \sqrt{1^2 + 25 + 9}$

$= \sqrt{35}$

$||U||_\infty$ (infinity norm) $=$ Max $[1, -5, 3]$

$= 3$

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(VII) $(A^n)^{-1} = (A^{-1})^n$

$(A^n)^{-1} = \cancel{A.A_1.A_2.A_3} \; (A.A.A....A_n)^{-1}$

$= A^{-1}.A^{-1}.A^{-1}...A_n^{-1}$

$= (A^{-1})^n$

(VIII) $(A^T)^{-1} = (A^{-1})^T$

$\Rightarrow A^T.(A^{-1})^T = (A^{-1}A)^T = (I)^T = I$

$\Rightarrow (A^{-1})^T A^T = (AA^{-1})^T = I^T = I$

So $A^T.(A^{-1})^T = (A^{-1})^T.A^T = I$

which completes the proof