SUMMARY OF SECTION 4.1

AN <u>ORDERED N-TUPLE</u> IS A SEQUENCE OF N REAL NUMBERS $(A_1, A_2, \ldots, A_N)$. THE SET OF ALL ORDERED N-TUPLES IS CALLED <u>N-SPACE</u> AND IS DENOTED BY $\mathbb{R}^N$.

LET $\vec{U} = (U_1, U_2, \ldots, U_N)$ AND $\vec{V} = (V_1, V_2, \ldots, V_N)$. THEN

$\vec{U} = \vec{V} \iff U_1 = V_1,\ U_2 = V_2,\ \ldots,\ U_N = V_N,$

$\vec{U} + \vec{V} = (U_1 + V_1, U_2 + V_2, \ldots, U_N + V_N)$ & $k\vec{U} = (kU_1, kU_2, \ldots, kU_N)$.

THE NEGATIVE OF $\vec{U}$ IS DENOTED $-\vec{U}$ AND IS DEFINED BY

$-\vec{U} = (-U_1, -U_2, \ldots, -U_N)$ SO THAT

$\vec{V} - \vec{U} = \vec{V} + (-\vec{U}) = (V_1 - U_1, V_2 - U_2, \ldots, V_N - U_N)$.

THE ZERO VECTOR IS $\vec{0} = (0, 0, \ldots, 0)$.

<u>THM 1</u> – IF $\vec{U}, \vec{V}$ AND $\vec{W}$ ARE IN $\mathbb{R}^N$ AND k & L ARE SCALARS, THEN

$\vec{U} + \vec{V} = \vec{V} + \vec{U}$, $\vec{U} + (\vec{V} + \vec{W}) = (\vec{U} + \vec{V}) + \vec{W}$, $\vec{U} + \vec{0} = \vec{0} + \vec{U} = \vec{U}$,

$\vec{U} + (-\vec{U}) = \vec{U} - \vec{U} = \vec{0}$, $k(L\vec{U}) = (kL)\vec{U}$, $k(\vec{U} + \vec{V}) = k\vec{U} + k\vec{V}$,

$(k+L)\vec{U} = k\vec{U} + L\vec{U}$, $1 \cdot \vec{U} = \vec{U}$.

THE <u>DOT PRODUCT</u> OF $\vec{U}$ AND $\vec{V}$ IS $\vec{U} \cdot \vec{V} = U_1 V_1 + U_2 V_2 + \cdots + U_N V_N$.

<u>THM 2</u> – $\vec{U} \cdot \vec{V} = \vec{V} \cdot \vec{U}$, $(\vec{U} + \vec{V}) \cdot \vec{W} = \vec{U} \cdot \vec{W} + \vec{V} \cdot \vec{W}$,

$(k\vec{U}) \cdot \vec{V} = k(\vec{U} \cdot \vec{V})$, $\vec{V} \cdot \vec{V} \geq 0$ AND $\vec{V} \cdot \vec{V} = 0 \iff \vec{V} = \vec{0}$