	Sidean Vactor Sp	aces:		0.24.04.11.
	(2,3)	무한 물은 보이를 모이를 Vecdor Space R^	E 37	
* Vectors in 2-space	ce, 3-space, and	u-space.		
· Ve	ector. U=	AB		
	Á	AB = W7		
	equiu	plant: Same direction	and size.	
	<u>U</u> =		30 488 \$1500	
	/	4.)		
Varton Congrations	(MC/M) Down			
Vactor Operations add	ition.	red(cc).	· Scalar autipolo	codion.
· vador Operations	ition.	$Q + \omega = \omega + \omega$	·Scalar authipla	ication.
· add	ition.	Q+10 = 10+10	of /ku	ication.
· add	ution.		of /ku	radion.
· add	vaction.	Q+10 = 10+10	of /ku	codion.
	vaction.	Q+10 = 10+10	of /ku	radion.

# vectors o	in Coentuate Systems.	
	(X, y). → (X主) DICE Comparent. His DICE	
Def 3)	U+co = (U,tw,, O+co,, Va+co).	U+D=O+D
Than 3-1.1).	ky = (ku,, ku,, ku).	(N+D)+M=N+(D+M).
Than 3.1.2)	$-\underline{U} = (-U_1, -U_2, \dots, -U_n).$	U+0=0+U=U
	$\omega - V = \omega + (-v).$	<u>U+(-U)=0.</u>
	= (W,-U,, W2-U2,, Wu-Uu).	10(U+0)=60+60
		(class) = (km)u
		$ \alpha = \overline{\alpha}$
		O <u>U</u> = 0.
		100 20.
		(-1) =

	Vorm. Post Product. and Pistance in IR
ν . Δ	
# Norm of a	a Vector
, , , , , , , , , , , , , , , , , , , ,	
	12 - (11 10) C mg
	$\underline{V} = (V_1, V_2) \cdots \in \mathbb{R}^2, V = \int U_1^2 + U_2^2$
	$U = (U_1, U_2, \dots U_n) \dots \in \mathbb{R}^n$, $ U = \int U_1^2 + U_2^2 + \dots U_n^2$
* ex 1)	$ U = \int (-3)^2 + 2^2 + (^2 = \sqrt{14})$
* Thun 3.2.1.	(a) 11V11 >0
	(b) 11011=0 then U=0
	(c) <u>kull = c · u</u>
# Unit Vector.	Norm=1.
	S. * Novaralization.
	$\underline{U} \longrightarrow \underline{U} \qquad \underline{U} = \underline{\underline{U}}$
	\$.
)
Standard (Inid Vectors.
	· R^ (1,0), (0,1). → 미축의 ② 양희 방향.
	(0,1,,0) × standard hasis (0,1,
	(0,0,,()
	Cn= (0,0,, #)
	= U.e. + U2e2 + + Unen = linea Combination.
	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$

# Distance in	R ^.
	$\underline{U} = (U_1, U_2, \dots, U_n)$
	$\underline{U} = (U_1, U_2, \dots, U_n).$
	$= \int (u, -u_1)^2 + (u_2 - u_2)^2 + \dots + (u_n - u_n)^2$
	0 (0, 01) + (02-02) + 1+ (0n-01)
# Det Product.	
	HU11 / 4 0505180°
	HUN DE
* Dol 2)	<u> 연한점이 골"</u> <u> </u>
NUET 37	(= Euclidian Inner Product) "Right Stal 412"
	C- Challain Inner (roduct). There sold 912
* Ex 5).	T ²
	(0,0,1) 6=45°.
	(0,22) E WILL HUN COS 150
	U. U = 11 11 11 11 11 Cos 45°
	$= \sqrt{0+0+1} \sqrt{0+2+2^2} \frac{\sqrt{2}}{2}$
	$=2\sqrt{2}\frac{\sqrt{2}}{2}$
# Component from	of the Dat. Product.
7.000	and a safe of the
	M - M 11 x - M 11 2
	= 11/11 + 11/11 = - 21/14 11/1 1/2050
	$\Rightarrow (U_1 - U_1)^2 + (U_2 - U_2)^2 = U_1^2 + U_2^2 + U_1^2 + U_2^2 - 2U \cdot U_2$
	$\underline{U} \cdot \underline{V} = U_1 U_1 + U_2 U_2$

* Ex 7)	U,= (K,0,0) d= (K,K,K)	Ĩ.v.
	Ue= (0, k, 0) = U, tU2+U3	k >
	Us= (0,0,K)	le V
		U1. d = 114,11 11 d 11 coso.
		COSO = Wd
		11 <u>U.</u> m & a
r Than 32.2	· <u>u - u </u>	· O · U = O , U· O = O.
323.	· (U).(0+w)= U.V+U.W	· (\alpha +
	· k(u.u) =(ku). v	· a. (0-m)= a.n- a.m
	· <u>U·U</u> >0.	· (U-V)· · · · · · · · · · · · · · · · · · ·
	· U·U=0 when U=0	- K(a. V) = a (KV)
	· [11 11 11 2 12 12 11 11 11 12 11 11 11 11	2
Cauchy - Sel	TV-V = $ V \Rightarrow \sqrt{ V-V ^2} = V $ howarz Inequality, Angles in \mathbb{R}^n .	1
Cauchy - Sel	·	,
Cauchy - Sel	The analyty, Angles in \mathbb{R}^n . $\cos\theta = \frac{u \cdot v}{ u v } \rightarrow \cos\theta \leq 1$	
Cauchy - Seb	howers Inequality, Angles in \mathbb{R}^n . $\cos\theta = \frac{u \cdot v}{\ u\ \ \ v\ } \rightarrow \cos\theta \leq 1$ $-1 \leq \frac{u \cdot v}{\ u\ \ v\ } \leq 1 \rightarrow -(u)$	((()) ムマーカマ (()) (()) () () () () () () () () () ()
Cavehy - Seb	howers Inequality, Angles in \mathbb{R}^n . $\cos\theta = \frac{u \cdot v}{\ u\ \ \ v\ } \rightarrow \cos\theta \leq 1$ $-1 \leq \frac{u \cdot v}{\ u\ \ v\ } \leq 1 \rightarrow -(u)$	
Cauchy - Sch	howers Inequality, Angles in \mathbb{R}^n . $\cos\theta = \frac{u \cdot v}{\ u\ \ \ v\ } \rightarrow \cos\theta \leq 1$ $-1 \leq \frac{u \cdot v}{\ u\ \ \ v\ } \leq 1 \rightarrow -\ u\ $ $\cos\theta = 1$	((()) ムマーカマ (()) (()) () () () () () () () () () ()
Cauchy - Sed	Therefore Inequality, Angles in \mathbb{R}^n . $ \cos \theta = \frac{u \cdot v}{\ u\ \ \ v\ } \rightarrow \cos \theta \leq 1 $ $ -1 \leq \frac{u \cdot v}{\ u\ \ \ v\ } \leq 1 \qquad \longrightarrow -\ u\ \ v\ $ $ \cos \theta = \frac{u \cdot v}{\ u\ \ \ v\ } \leq 1 \qquad \longrightarrow -\ u\ \ v\ $	マ Cos @ マーハマ ログロロカロ
Cauchy - Sel	Therefore Inequality, Angles in \mathbb{R}^n . $ \cos \theta = \frac{u \cdot v}{\ u\ \ \ v\ } \rightarrow \cos \theta \leq 1 $ $ -1 \leq \frac{u \cdot v}{\ u\ \ \ v\ } \leq 1 \qquad \longrightarrow -\ u\ \ v\ $ $ \cos \theta = \frac{u \cdot v}{\ u\ \ \ v\ } \leq 1 \qquad \longrightarrow -\ u\ \ v\ $	11011 77 7 11 7 11 11 11 15 11 TOSO 7 11 7 11 11 11 11 11 11 TOSO 7 11 11 11 11 11 11 11 11 11 11 11 11 1
Cauchy - Sel	Therefore Inequality, Angles in \mathbb{R}^n . $ \cos \theta = \frac{u \cdot v}{\ u\ \ \ v\ } \rightarrow \cos \theta \leq 1 $ $ -1 \leq \frac{u \cdot v}{\ u\ \ \ v\ } \leq 1 \qquad \longrightarrow -\ u\ \ v\ $ $ \cos \theta = \frac{u \cdot v}{\ u\ \ \ v\ } \leq 1 \qquad \longrightarrow -\ u\ \ v\ $	(1171111111111111111111111111111111111
Cauchy - Sel	Therefore Inequality, Angles in \mathbb{R}^n . $ \cos \theta = \frac{u \cdot v}{\ u\ \ \ v\ } \rightarrow \cos \theta \leq 1 $ $ -1 \leq \frac{u \cdot v}{\ u\ \ \ v\ } \leq 1 \qquad \longrightarrow -\ u\ \ v\ $ $ \cos \theta = \frac{u \cdot v}{\ u\ \ \ v\ } \leq 1 \qquad \longrightarrow -\ u\ \ v\ $	11011 77 7 11 7 11 11 11 15 11 TOSO 7 11 7 11 11 11 11 11 11 TOSO 7 11 11 11 11 11 11 11 11 11 11 11 11 1
Cauchy - Sel	Therefore Inequality, Angles in \mathbb{R}^n . $ \cos \theta = \frac{u \cdot v}{\ u\ \ \ v\ } \rightarrow \cos \theta \leq 1 $ $ -1 \leq \frac{u \cdot v}{\ u\ \ \ v\ } \leq 1 \qquad \longrightarrow -\ u\ \ v\ $ $ \cos \theta = \frac{u \cdot v}{\ u\ \ \ v\ } \leq 1 \qquad \longrightarrow -\ u\ \ v\ $	11011 77 7 11 7 11 11 11 15 11 TOSO 7 11 7 11 11 11 11 11 11 TOSO 7 11 11 11 11 11 11 11 11 11 11 11 11 1
Cauchy - Sel	Therefore Inequality, Angles in \mathbb{R}^n . $ \cos \theta = \frac{u \cdot v}{\ u\ \ \ v\ } \rightarrow \cos \theta \leq 1 $ $ -1 \leq \frac{u \cdot v}{\ u\ \ \ v\ } \leq 1 \qquad \longrightarrow -\ u\ \ v\ $ $ \cos \theta = \frac{u \cdot v}{\ u\ \ \ v\ } \leq 1 \qquad \longrightarrow -\ u\ \ v\ $	11011 77 7 11 7 11 11 11 15 11 TOSO 7 11 7 11 11 11 11 11 11 TOSO 7 11 11 11 11 11 11 11 11 11 11 11 11 1
Cauchy - Sel	Therefore Inequality, Angles in \mathbb{R}^n . $ \cos \theta = \frac{u \cdot v}{\ u\ \ \ v\ } \rightarrow \cos \theta \leq 1 $ $ -1 \leq \frac{u \cdot v}{\ u\ \ \ v\ } \leq 1 \qquad \longrightarrow -\ u\ \ v\ $ $ \cos \theta = \frac{u \cdot v}{\ u\ \ \ v\ } \leq 1 \qquad \longrightarrow -\ u\ \ v\ $	11011 77 7 11 7 11 11 11 15 11 TOSO 7 11 7 11 11 11 11 11 11 TOSO 7 11 11 11 11 11 11 11 11 11 11 11 11 1
Cauchy - Sel	Therefore Inequality, Angles in \mathbb{R}^n . $ \cos \theta = \frac{u \cdot v}{\ u\ \ \ v\ } \rightarrow \cos \theta \leq 1 $ $ -1 \leq \frac{u \cdot v}{\ u\ \ \ v\ } \leq 1 \qquad \longrightarrow -\ u\ \ v\ $ $ \cos \theta = \frac{u \cdot v}{\ u\ \ \ v\ } \leq 1 \qquad \longrightarrow -\ u\ \ v\ $	11011 77 7 11 7 11 11 11 15 11 TOSO 7 11 7 11 11 11 11 11 11 TOSO 7 11 11 11 11 11 11 11 11 11 11 11 11 1

4 (4)	
# Geo water in	R ⁿ
400.0004	
× Thun 3.2.5).	- 114+0 11 5 11411 + 11511
,	$d(u,v) \leq d(u,w) + d(w,v)$
	2(4)01 = 2(4,4)(2101)
	d(u,v)
	·d(4,4) → 自治过 d ≤ B+r.
	Les d(u,w)
-	
Than 3,2.6)	A 7-0
	(U+v)·(u+v)+(u-v)·(u-v) = 2 (114112+111112
	11 11 + 11 U1 + 2 U. U
	+114112+114112-24-4
Thun 3.2.7)	11 n+ n1 = (n+n) (n+n) = 11 n1 = - 5(n · n) + 11 n 11 = .
	$ \underline{\alpha} - \overline{\alpha} _{\bullet} = (\overline{\alpha} - \overline{\alpha})(\overline{\alpha} - \overline{\alpha}) = \overline{\alpha} _{\bullet} - 2(\overline{\alpha} - \overline{\alpha}) + \overline{\alpha} _{\bullet}.$
	4 (U.V) = ((U+U)2-1(U-V)12.
	$u \cdot v = \frac{1}{4} u + v _2 - \frac{1}{4} u - v _2$
# Dat Product	s as Matrix multiplication.
	$\cdot U \cdot V = U^T U = U^T U$
	$ \frac{\mathcal{U} \cdot \mathcal{V}}{\mathcal{U}} = \frac{\mathcal{U}^{T} \mathcal{U}}{\mathcal{U}} = \frac{\mathcal{U}^{T} \mathcal{U}}{\mathcal{U}} $
	$ \frac{\mathcal{U} \cdot \mathcal{V}}{2} = \frac{\mathcal{U}^T \mathcal{U}}{2} = \frac{\mathcal{U}^T \mathcal{U}}{2} $ $ = \begin{bmatrix} 1 & -3 & 5 \end{bmatrix} \begin{bmatrix} 5 \\ 4 \\ 0 \end{bmatrix} = -7 2$
	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
	$= \begin{bmatrix} 1 & -3 & 5 \end{bmatrix} \begin{bmatrix} 4 \\ 4 \end{bmatrix} = -7 2$ $= \begin{bmatrix} 5 & 4 & 0 \end{bmatrix} \begin{bmatrix} -3 \\ 5 \end{bmatrix} = -7$
	$ \begin{array}{l} \cdot U \cdot V = U^{T}U = U^{T}U \\ = \begin{bmatrix} 1 & -3 & 5 \end{bmatrix} \begin{bmatrix} 5 \\ 4 \end{bmatrix} = -7 & 7 \\ = \begin{bmatrix} 5 & 4 & 0 \end{bmatrix} \begin{bmatrix} -3 \\ 5 \end{bmatrix} = -7 \\ \end{array} $ $ \begin{array}{l} \times \text{ HAZE row vactors} \text{calcum Vactors} \text{degree} \text{degree} $
	= [1 -3 5] 4 = -7 } = [5 4 0] [-3] = -7 * 412e row vactoral calcum vactoral delicas 203 212 4 dd.
	$= \begin{bmatrix} 5 & 4 & -7 & 2 \\ -3 & 5 \end{bmatrix} = -7$ $= \begin{bmatrix} 5 & 4 & 0 \end{bmatrix} \begin{bmatrix} -3 \\ 5 \end{bmatrix} = -7$ $* \text{ HAZE row vectoral calcum vectoral delignos } \text{ Allows} = \text{ Vectoral delignos} $ $A: \text{ Nxm Matrix.} \qquad 2 (A \text{ W-V} = \text{ Vectoral})$
	= [1 -3 5] 4 =-7 ? = [5 4 0] [-3] =-7 * 412e row vectoral calcum vectoral 2303 212 4 21. A: N×M Matrix. ? (AW·V = U(Au) U: N×1 (olum vector. = (UTA) y
	$= \begin{bmatrix} 5 & 4 & -7 & 2 \\ -3 & 5 \end{bmatrix} = -7$ $= \begin{bmatrix} 5 & 4 & 0 \end{bmatrix} \begin{bmatrix} -3 \\ 5 \end{bmatrix} = -7$ $* HAZE row vectoral calcum vectoral delications of the property of$
	= [1 -3 5] 4 =-7 ? = [5 4 0] [-3] =-7 * 412e row vectoral calcum vectoral 2303 212 4 21. A: N×M Matrix. ? (AW·V = U(Au) U: N×1 (olum vector. = (UTA) y

# Dat Product	View of Matrix Multiplication.
,	$AB = \begin{bmatrix} r_1 \\ r_2 \\ \vdots \\ r_m \end{bmatrix} \begin{bmatrix} c_1 c_2 \cdots c_m \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$
	tu xxx axxa.
	M×2
	rich raca rich
	ron C, ron Ca ron Ch
* 4	