Tutorial 1 week 2

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9.5/10

1. $u = (-2, -k, 0, k)$ $v = (0, -k, 1, 2)$

$v+u = -2+0, -k+-k, 0+1, k+2$
$(-2, -2k, 1, k+2)$

$2v = 2(0), 2(-k), 2(1), 2(2)$
$(0, -2k, 2, 4)$

$\|u\| = \sqrt{-2^2 + -k^2 + 0^2 + k^2}$
$\sqrt{4 + 2k^2}$

$\|v\| = \sqrt{0^2 + -k^2 + 1^2 + 2^2}$
$\sqrt{5+k^2}$

$u \cdot v$ $-2(0) + -k(-k) + 0(1) + k(2)$
$-2 + k^2 + 2k$

$\cos^{-1} \dfrac{\cancel{-2} + 2k + k^2}{\sqrt{4+2k^2}\sqrt{5+k^2}}$

orthogonal ~~if~~ when $-2 + 2k + k^2 = 0$ $k^2 + 2k = 0$
$(k-2)(k+1)$ $k(k+2) = 0$
$k = 0$ or $k = -2$
will be orthogonal.

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OW.

iv. $u = (a, c, 0, b, 0)$ $\quad v = (c, -2a, c, 0, b+c)$

$u+v = a+c, \; c-2a, \; 0+c, \; b+0, \; 0+b+c$
$(a+c, \; c-2a, \; c, \; b, \; b+c)$

$2v = (2c \; -4a, \; 2c \; 0, \; 2b+2c)$

$\|u\| = \sqrt{a^2+c^2+0^2+b^2+0^2}$
$= \sqrt{a^2+b^2+c^2}$

$\|v\| = \sqrt{c^2+4a^2+c^2+b^2+c^2+2bc}$
$\sqrt{3c^2+4a^2+b^2+2bc}$

4.5

~~angle $\theta = \cos^{-1}$~~

$u \cdot v = a(c)+c(-2a)+0(c)+b(0)+0(b+c)$
$ac-2ac$

$\theta = \cos^{-1} \; ac-2ac = \dfrac{-ac}{\sqrt{a^2+b^2+c^2}\sqrt{3c^2+4a^2+b^2+2bc}}$

When $u \cdot v = 0$ orthogonal $-ac=0$
$a=0$ or $c=0$
if $a=0$ and $c=0$ then $\theta \neq 0$.

2 i.

$$\begin{array}{ccc} x & y & z \end{array}$$
$$\begin{pmatrix} 2 & 0 & -1 \\ 1 & -1 & +1 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} -2 \\ 4 \end{pmatrix}$$

ii.

$$\begin{array}{cccc} x & y & t & z \end{array}$$
$$\begin{pmatrix} 2 & 0 & -1 & 1 \\ 0 & -2 & 1 & 0 \\ -1 & -1 & 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \\ t \\ z \end{pmatrix} = \begin{pmatrix} -1 \\ -7 \\ 4 \end{pmatrix}$$

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Week 2 Set 1

20/1/14 Tutorial DAVID WEITBRECHT 12300644

1i. $u = (1,0,2)$ $v = (2,1,-1)$

$v+u = (1+2, 0+1, 2+(-1))$
$(3, 1, 1)$

$2v = (2(2), 2(1), 2(-1))$
$= (4, 2, -2)$

$\|u\| = \sqrt{1^2+0^2+2^2}$
$\sqrt{5}$

$\|v\|$ $\sqrt{(2)^2+(1)^2+(-1)^2}$
$= \sqrt{6}$

$u \cdot v = 1(2) + 0(1) + 2(-1)$
$2 + 0 - 2 = 0.$

angle. $\theta = \cos^{-1} \frac{u \cdot v}{\|u\|\|v\|} = \frac{0}{\sqrt{6}\sqrt{5}} = \frac{\pi}{2}.$

orthogonal if $\angle u,v, = \frac{\pi}{2}$

Not orthogonal angle = π not $\frac{\pi}{2}$

2

DW. 2

ii. $u = (1, -1, 0, -1, 0, 1)$ $\quad v(0, 1, 0, -2, -1, 0)$

$v + u = 1+0, -1+1, 0+0, -1+-2, 0+-1, 1+0$

$(1, 0, 0, -3, -1, 1)$

$2v = 2(0), 2(1), 2(0), 2(-2), 2(-1), 2(0)$

$(0, 2, 0, -4, -2, 0)$

$\|u\| = \sqrt{1^2 + (-1)^2 + (0)^2 + (-1)^2 + (0)^2 + (1)^2}$

$\sqrt{4} = 2.$

$\|v\| = \sqrt{0^2 + 1^2 + 0^2 + (-2)^2 + (-1)^2 + 0^2}$

$= \sqrt{6}.$

$u \cdot v = (1)(0) + -1(1) + 0(0) + -1(-2) + 0(-1) + 1(0)$

$-1 \quad +2$

$= 1$

$\cos^{-1} \quad \frac{1}{2\sqrt{6}} = 78°$

NOT ORTHOGONAL, Angle not 45.