1-18-24 Will Legg

Week 1 Review

Ex1 vectors $\langle a, a^2, 1\rangle$ and $\langle -a, 1, 0\rangle$ are orthogonal to one another

$(a)(-a) + a^2(1) + 1(0) = -a^2 + a^2 + 0 = 0$

dot product $= 0$ so orthogonal

True

Ex2 Consider vectors $u = \langle 1, 2, 3\rangle$ and $v = \langle 4, 0, -3\rangle$

find $\text{proj}_u(v) \cdot \langle 1, 1, 1\rangle$

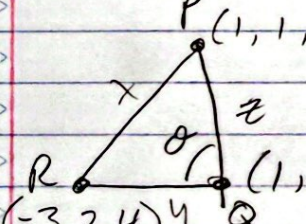
$$\text{proj}_u(v) = \frac{u \cdot v}{\|u\|^2} \cdot u$$

$$= \left(\frac{1(4) + 2(0) + 3(-3)}{\left(\sqrt{(1)^2 + (2)^2 + (-3)^2}\right)^2} \cdot \langle 1, 2, 3\rangle\right) \cdot \langle 1, 1, 1\rangle$$

$$= \frac{-5}{14} \cdot \langle 1, 2, 3\rangle = \left\langle \frac{-5}{14}, \frac{-10}{14}, \frac{-15}{14}\right\rangle \cdot \langle 1, 1, 1\rangle$$

$$= -2.143$$

Ex3 Consider triangle $P(1, 1, 1)$, $Q(1, -3, 2)$ & $R(-3, 2, 4)$ find $\angle Q$ rads



$$x = \sqrt{(1-(-3))^2 + (1-2)^2 + (1-4)^2}$$

$$x = \sqrt{26}$$

$$y = \sqrt{(1-(-3))^2 + (-3-2)^2 + (2-4)^2}$$

$$y = \sqrt{29}$$

$$z = \sqrt{17}$$

$$\angle Q = \sin^{-1}\left(\frac{\sqrt{17}}{\sqrt{29}}\right) = 0.872$$

$$\angle Q = \frac{\overrightarrow{QR} \cdot \overrightarrow{QP}}{|QR| \cdot |QP|} = \frac{(R-Q) \cdot (P-Q)}{}$$

Ex. 4 | .995

HW Review Week 1

Ex 5 find unit vector $w = ai + bj + ck$ that is perpendicular to both $u = 5i - 3k$ and $v = 2i + 7j$ what is $|a|$

$u = \langle 5, 0, -3 \rangle$ $v = \langle 2, 7, 0 \rangle$

$$\vec{u} \times \vec{v} = \begin{vmatrix} i & j & k \\ 5 & 0 & -3 \\ 2 & 7 & 0 \end{vmatrix} = (0(0) - (-3)7)i - (5(0) - (-3)(2))j + (5(7) - 0(2))k$$

$$= 21i - 6j + 35k$$

$$w = \pm \frac{\vec{u} \times \vec{v}}{|\vec{u} \times \vec{v}|} = \pm \frac{\langle 21, -6, 35 \rangle}{\sqrt{21^2 + (-6)^2 + 35^2}}$$

$$a = \frac{21}{\sqrt{21^2 + (-6)^2 + 35^2}}$$

Ex 3 $QR \cdot QP = 18$

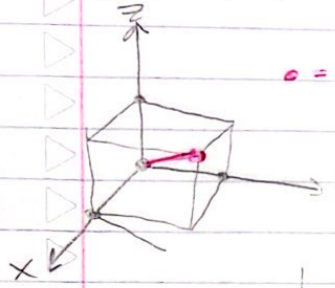
$$|\overrightarrow{QR}| = \sqrt{(-4)^2 + 5^2 + 2^2} = \sqrt{45}$$

$$|QP| = \sqrt{0^2 + 4^2 + (-1)^2} = \sqrt{17}$$

$$= \cos^{-1}\left(\frac{18}{\sqrt{45} \cdot \sqrt{17}}\right) = 0.862$$

Week 01 Review

Ex 4 $\theta = \cos^{-1}\left(\frac{\text{diag} \cdot \text{edge}}{|\text{diag}| \cdot |\text{edg}|}\right)$



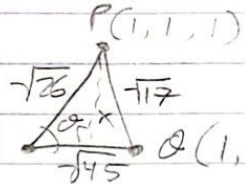
$o = \langle 1,1,1 \rangle$

$\text{diag} = \langle 1,1,1 \rangle$

$\text{edge} = \langle 1,0,0 \rangle$

$= \frac{1}{\sqrt{3} \cdot 1} = \boxed{\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)}$

Ex 6



$\overline{PQ} = \sqrt{(1-1)^2 + (-3-1)^2 + (2-1)^2}$

$\overline{QR} = \sqrt{(1--3)^2 + (-3-2)^2 + (2-4)^2} = \sqrt{45}$

$\overline{PR} = \sqrt{(-3-1)^2 + (2-1)^2 + (4-1)^2}$

$A = \frac{1}{2}(\sqrt{45})$

$\angle R = \frac{QR \cdot PR}{|QR| \cdot |PR|} = \frac{(-1) \cdot 3}{\sqrt{45} \cdot \sqrt{26}}$

~~$\sin\left(\frac{\pi}{2}\right) =$~~

$\angle R \quad \cos^{-1}\left(-\frac{3}{\sqrt{45} \cdot \sqrt{26}}\right)$

~~$\sin\left(\cos^{-1}\left(-\frac{3}{\sqrt{45} \cdot \sqrt{26}}\right)\right) = \frac{h}{\sqrt{26}}$~~