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Worksheet 4

$|u| = \sqrt{1 + \frac{1}{2} + 4}$

Exercise 1. Determine the magnitude of the cross product of $\mathbf{u} = \langle 2, 1, 4 \rangle$ and $\mathbf{v} = \langle -1, -0.5, -2 \rangle$.

$|v| = \sqrt{4 + 1 + 16}$

$\sqrt{21} \cdot \sqrt{5.5}$

2 -1
1 -0.5
4 -2

$2(-1) + (1 \times -0.5) + (4 \times -2)$

$-2 - 0.5 - 8 = -10.5 = |u||v|\cos\theta$

$\langle -2 - -2, -4 - -4, -1 - -1 \rangle = \langle 0, 0, 0 \rangle$

$\theta = 180$

$\sin(180) = 0$

$|u \times v| = 0$

Exercise 2. Find the following cross products:

a) $\mathbf{i} \times \mathbf{j} = k$

b) $\mathbf{k} \times \mathbf{i} = j$

c) $\mathbf{i} \times \mathbf{k} = -j$

d) $\mathbf{j} \times \mathbf{j} = 0$

a: $\langle 1, 0, 0 \rangle, \langle 0, 1, 0 \rangle$

1 0
0 1 $= \langle 0, 0, 1 \rangle$
0 0

d: $\langle 0, 1, 0 \rangle \langle 0, 1, 0 \rangle$

0 0
1 1 $= \langle 0, 0, 0 \rangle$
0 0

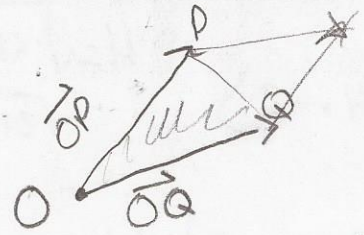
b: $\langle 0, 0, 1 \rangle, \langle 1, 0, 0 \rangle$

0 1
0 0 $= \langle 0, 1, 0 \rangle$
1 0

c: $\langle 1, 0, 0 \rangle \langle 0, 0, 1 \rangle$

1 0
0 0 $= \langle 0, -1, 0 \rangle$
0 1

Exercise 3. Determine the area of the triangle with vertices $O(0,0,0)$, $P(2,3,4)$, and $Q(3,2,0)$.



$\vec{OP} = \langle 2, 3, 4 \rangle$

$\vec{OQ} = \langle 3, 2, 0 \rangle$

$\vec{OP} \times \vec{OQ} =$ 2 3 / 3 2 / 4 0

$\langle 0-8, 12-0, 4-9 \rangle$

$\langle -8, 12, -5 \rangle$

$\sqrt{64 + 144 + 25}$

$\frac{\sqrt{233}}{2} = \text{Area}$