13.1 -

① Are $\overrightarrow{AB}$ & $\overrightarrow{PQ}$ parallel? Do they pt. in the same direction?

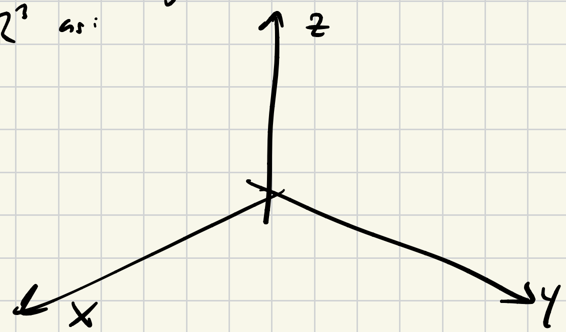
$$A = (1,1), \quad B = (3,4), \quad P = (1,1), \quad Q = (7,10)$$

② $R = (-2,7)$, calculate length of $\overrightarrow{OR}$.

③ Find components of $3(3i - 4j) + 5(i + 4j)$

13.2 -

① What is the right-hand rule? Why does it tell us to label $\mathbb{R}^3$ as:



② Show $r(t)$ & $s(t)$ define the same line:

$$r(t) = \langle 3, -1, 4 \rangle + t\langle 8, 12, -6 \rangle$$

$$s(t) = \langle 11, 11, -2 \rangle + t\langle 4, 6, -3 \rangle$$

③ Find pt. of intersection of (if it exists):

$$r_1(t) = \langle 2, 1, 1 \rangle + t\langle -4, 0, 1 \rangle$$

$$r_2(s) = \langle -4, 1, 5 \rangle + s\langle 2, 1, -2 \rangle$$

13.3 -

① Find the angle between $\langle 3,1,1\rangle$ & $\langle 2,-4,2\rangle$

② Let v, w be non-zero vectors and let $u = ev + ew$

Show the angle between u & v is the same as the angle between u & w

③ If $v \cdot a = w \cdot a$ for non-zero vectors $v, w, a \in \mathbb{R}^3$, is it true that $v = w$?

13.4 -

① Assume $u \times v = \langle 1,1,0\rangle$, $u \times w = \langle 0,3,1\rangle$,

$v \times w = \langle 2,-1,1\rangle$

Use the properties of the cross product to find:

a) $(3u + 4w) \times w$

b) $(u+v) \times (u-v)$

② What is $i \times j$, $j \times k$, $k \times i$?

③ Compute the volume of the parallelepiped spanned by:

$u = \langle 2,2,1\rangle$, $v = \langle 1,0,3\rangle$, $w = \langle 0,-4,0\rangle$

13.5 -

① Find the equation of a plane with normal vector

$n = \langle 1,3,2 \rangle$ that goes through $(4,-1,1)$

② Find the equation of the plane passing through:

$P = (2,-1,4)$, $Q = (1,1,1)$, $R = (3,1,-2)$

③ Find point of intersection of:

$$x + y + z = 14$$

$$r(t) = \langle 1,1,0 \rangle + t\langle 0,2,4 \rangle$$

14.1 -

① Does $r(t) = \langle \sin t, \cos t/2, t \rangle$ intersect the z-axis? If so, where?

② Find the center and radius of the circle:

$$r(t) = 7i + (12\cos t)j + (12\sin t)k$$

14.2 -

① Let $r_1(t) = \langle t^2, t^3, t \rangle$, $r_2(t) = \langle e^{3t}, e^{2t}, e^{t} \rangle$

a. $\frac{d}{dt}\left(r_1(t) \cdot r_2(t)\right)$

b. $\frac{d}{dt}\left(r_1(t) \times r_2(t)\right)$

② $\int_{-2}^{2} \langle t^2 + 4t,\ 4t^3 - t \rangle \, dt$

H.3 -

① Find length of: $r(t) = \langle 2t, \ln(t), t^2 \rangle$, $1 \le t \le 4$

② Find the arc length function $s(t)$ for:

$r(t) = \langle t^2, 2t^2, t^3 \rangle$, $a = 0$

③ Find arc length parameterizations of:

a) $r(t) = \langle 3t+1, 4t-5, 2t \rangle$

b) $r(t) = \langle e^t \sin t, e^t \cos t, e^t \rangle$