

1) Obtain the unit vector in the direction from the origin toward the point $P(3, -3, -2)$.

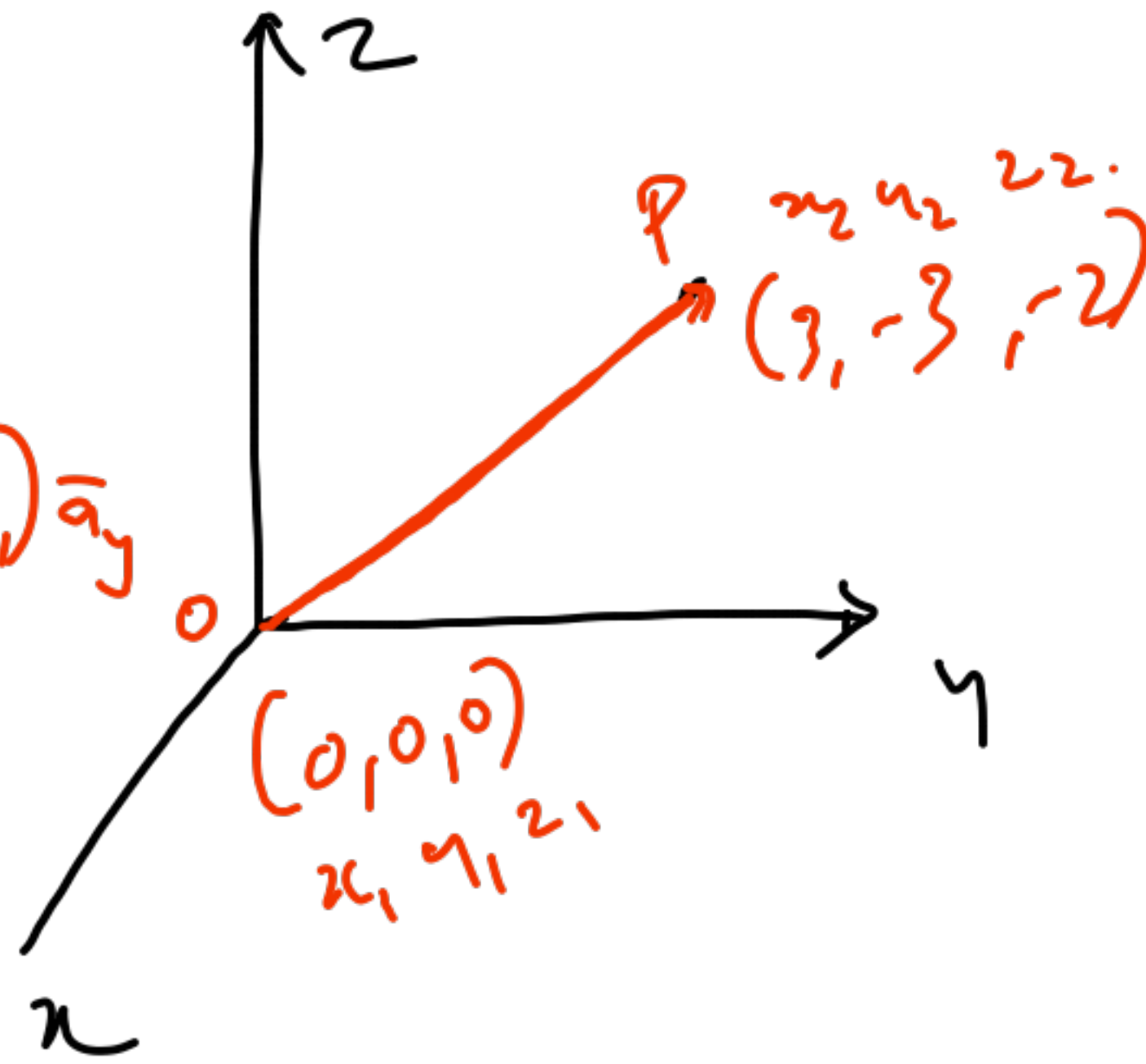
SM.

$$\overline{OP} = (x_2 - x_1)\bar{a}_x + (y_2 - y_1)\bar{a}_y + (z_2 - z_1)\bar{a}_z$$

$$\overline{OP} = 3\bar{a}_x - 3\bar{a}_y - 2\bar{a}_z$$

$$|\overline{OP}| = \sqrt{(3)^2 + (-3)^2 + (-2)^2}$$

$$|\overline{OP}| = 4.69$$



$$\bar{a}_{OP} = \frac{\overline{OP}}{|\overline{OP}|}$$

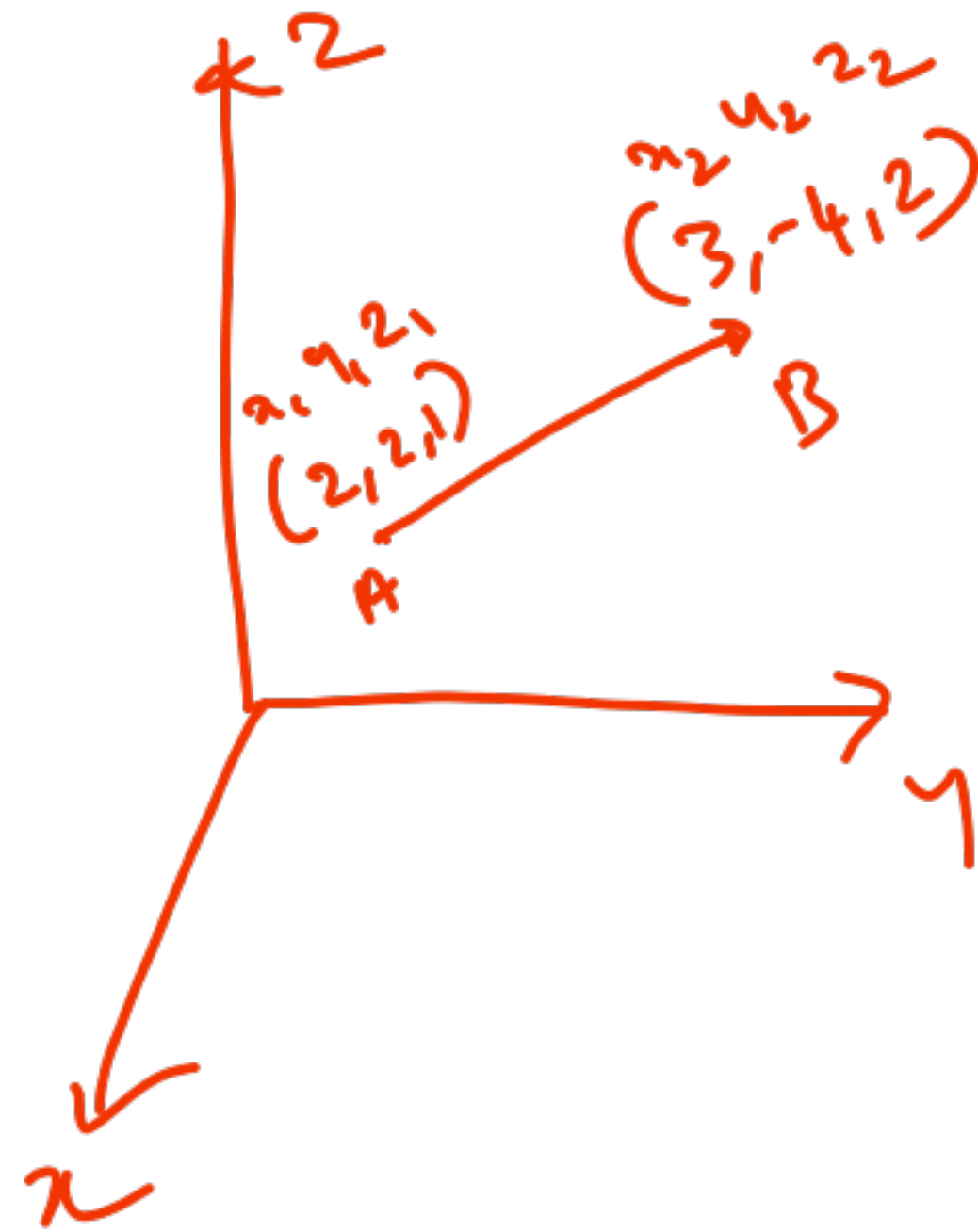
$$= \frac{3\bar{a}_x - 3\bar{a}_y - 2\bar{a}_z}{4.69}$$

$$\bar{a}_{OP} = 0.6396\bar{a}_x - 0.6396\bar{a}_y - 0.4264\bar{a}_z$$

$$|\bar{a}_{OP}| = \sqrt{(0.6396)^2 + (-0.6396)^2 + (-0.4264)^2}$$

$$= 1$$

2) Two points $A(2, 2, 1)$ and $B(3, -4, 2)$ are given in the rectangular system. Obtain the vector from A to B and a unit vector directed from A to B.



$$\vec{A} = 2a_x + 2a_y + a_z$$

$$\vec{B} = 3a_x - 4a_y + 2a_z$$

$$\begin{aligned} \vec{AB} &= (x_2 - x_1)a_x + (y_2 - y_1)a_y + (z_2 - z_1)a_z \\ &= (3 - 2)a_x + (-4 - 2)a_y + (2 - 1)a_z \end{aligned}$$

$$\vec{AB} = a_x - 6a_y + a_z$$

$$|\vec{AB}| = 6.16 = \sqrt{38}$$

$$\begin{aligned} \hat{a}_{AB} &= \frac{\vec{AB}}{|\vec{AB}|} \\ &= \frac{a_x - 6a_y + a_z}{\sqrt{38}} \end{aligned}$$

$$\begin{aligned} \hat{a}_{AB} &= 0.1622\hat{a}_x - \\ &\quad 0.9733\hat{a}_y + 0.1622\hat{a}_z \end{aligned}$$

$$\begin{aligned} |\hat{a}_{AB}| &= \sqrt{(0.1622)^2 + (-0.9733)^2 + (0.1622)^2} \\ &= \end{aligned}$$

