① If $\vec{r} = \langle x, y, z \rangle$ and $\vec{r_0} = \langle x_0, y_0, z_0 \rangle$, describe the set of all points (x, y, z) such that

$$\| \vec{r} - \vec{r_0} \| = 1$$

② Which expression makes sense: where $\cdot$ is dot-product

a) $\left[\vec{a} \cdot \vec{b} \right] \vec{c}$

b) $\| \vec{a} \| \left(\vec{b} \cdot \vec{c} \right)$

c) $\vec{a} \cdot (\vec{b} + \vec{c})$

d) $\vec{a} \cdot \vec{b} + \vec{c}$

e) $\| \vec{a} \| \cdot (\vec{b} + \vec{c})$

③ Find dot product of two vectors if their lengths are 6 and $\frac{1}{3}$ and the angle between them is $\pi/4$.

④ Find $\vec{a} \cdot \vec{b}$ for

a) $\vec{a} = \langle -2, \frac{1}{3} \rangle$, $\vec{b} = \langle -5, 12 \rangle$

b) $\vec{a} = \langle 4, 1, \frac{1}{4} \rangle$, $\vec{b} = \langle 6, -3, -8 \rangle$

⑤ Find angle between $\vec{a}$ and $\vec{b}$ for:

a) $\vec{a} = \langle \sqrt{3}, 1 \rangle$, $\vec{b} = \langle 0, 5 \rangle$

b) $\vec{a} = \langle 4, 0, 2 \rangle$, $\vec{b} = \langle 2, -1, 0 \rangle$

c) $\vec{a} = i + 2j - 2k$, $\vec{b} = 4i - 3k$

⑥ Are the vectors orthogonal, parallel, or neither?

a) $\vec{a} = \langle -5, 3, 7 \rangle$, $\vec{b} = \langle 6, -8, 2 \rangle$

b) $\vec{a} = \langle -3, 9, 6 \rangle$, $\vec{b} = \langle 4, -12, -8 \rangle$

c) $\vec{a} = \langle 7, 0, -2 \rangle$, $\vec{b} = \langle 2, 5, 7 \rangle$

(7) For what values of b are the vectors $\langle -6, b, 2 \rangle$ and $\langle b, b^2, b \rangle$ orthogonal?

(9) Find the directional angles (cosines) of $\langle 3, 4, 5 \rangle$

(14) Find the angle between a diagonal of a cube and one of its edges.