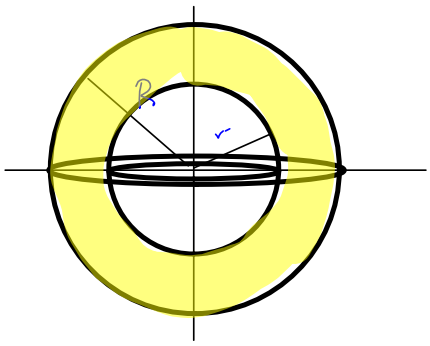
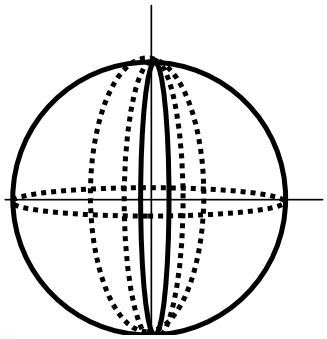
35. The region consisting of all points between (but not on) the spheres of radius r and R centered at the origin, where $r < R$

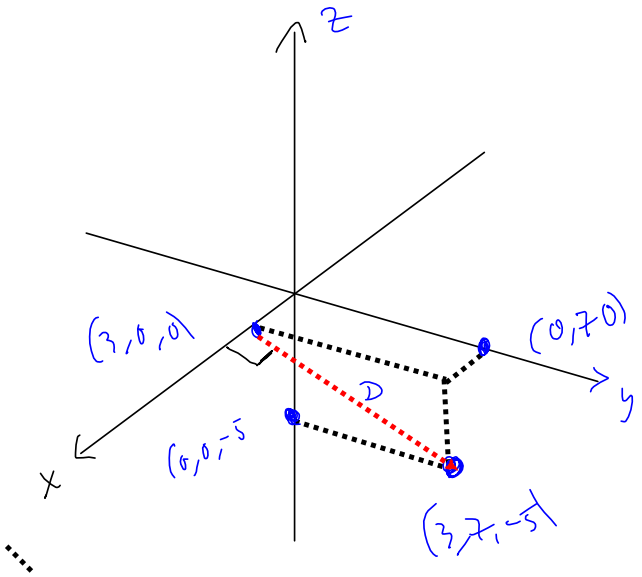
$$\{(x,y,z) \mid r < \sqrt{x^2+y^2+z^2} < R\}$$



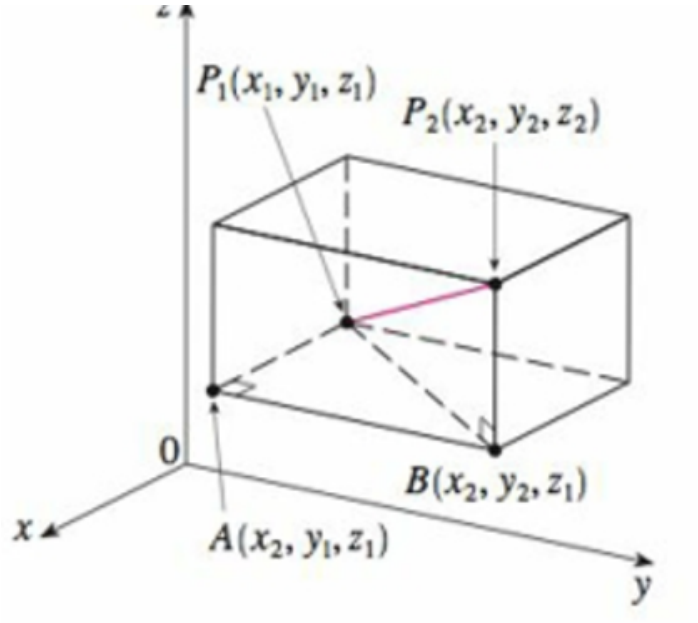


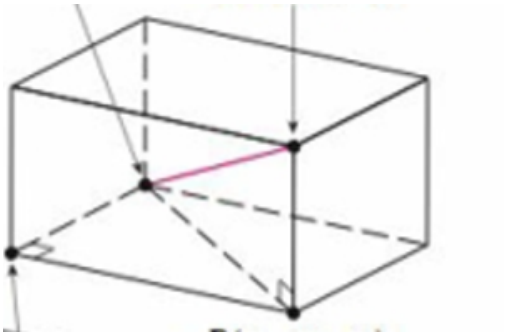
10. Find the distance from $(3, 7, -5)$ to each of the following.

(a) The xy-plane
(b) The yz-plane
(c) The xz-plane
(d) The x-axis
(e) The y-axis
(f) The z-axis



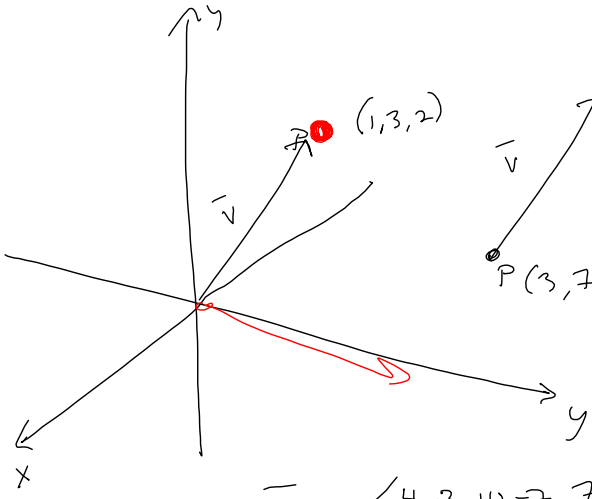
$$D = \sqrt{(3-3)^2 + (7-0)^2 + (-5-0)^2} = \sqrt{74}$$

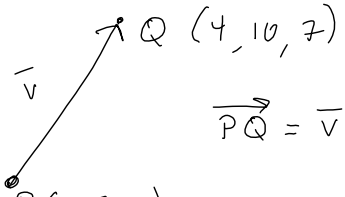

$P_1(x_1, y_1, z_1)$
$P_2(x_2, y_2, z_2)$
0
$B(x_2, y_2, z_1)$
$A(x_2, y_1, z_1)$
x
y



§ 13.2 Vectors

A vector is a directed line segment.





$\overrightarrow{PQ} = \bar{v}$

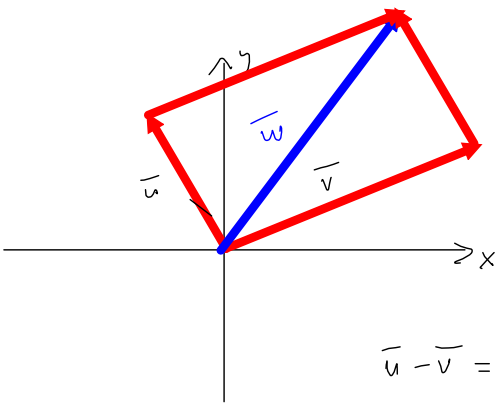
v scalar (number)

$\bar{v}$ vector

$\bar{v} = \langle 4-3, 10-7, 7-5 \rangle = \langle 1, 3, 2 \rangle = \bar{v}$

Vector addition: Nose to tail:

For ease, I'm going 2-D



$\bar{u} = \langle -3, 5 \rangle$

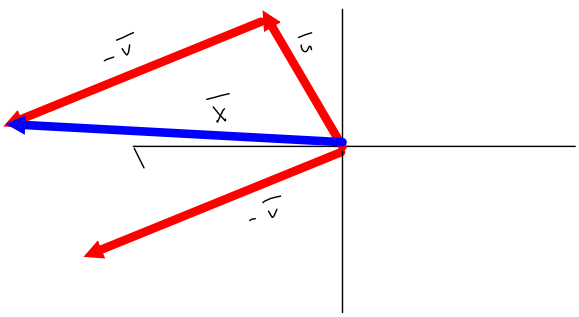
$\bar{v} = \langle 10, 5 \rangle$

$\bar{u} + \bar{v} = \langle -3+10, 5+5 \rangle$

$= \langle 7, 10 \rangle = \bar{w}$

$\bar{u} - \bar{v} = \bar{u} + (-\bar{v})$

$= \langle -3, 5 \rangle + \langle -10, -5 \rangle = \bar{x}$



Vector length / magnitude:

$\bar{u} = \langle u_1, u_2, u_3 \rangle \Rightarrow$

Magnitude of $\bar{u} = \sqrt{u_1^2 + u_2^2 + u_3^2}$

Dot Product: $\bar{v} = \langle v_1, v_2, v_3 \rangle$.

Then $\bar{u} \cdot \bar{v} = u_1 v_1 + u_2 v_2 + u_3 v_3$

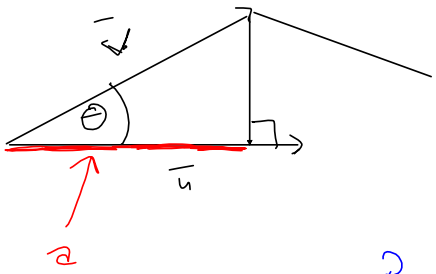
$\bar{u} = \langle 1, 2, 3 \rangle$, $\bar{v} = \langle 3, -5, 7 \rangle \Rightarrow$

$\bar{u} \cdot \bar{v} = 3 + (-10) + 21 = 14$

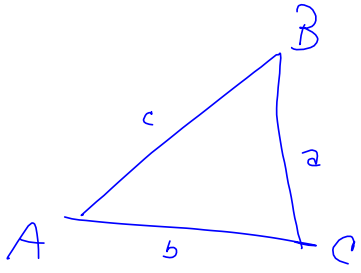
In a sense, this tells us roughly how much "in the same direction" **u** and **v** are.

If two vectors are perpendicular, their dot product is zero.

$\cos\theta = ?$



$\cos\theta = \frac{a}{\|\bar{v}\|}$



$a^2 = b^2 + c^2 - 2bc\cos A$