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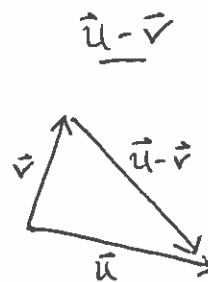
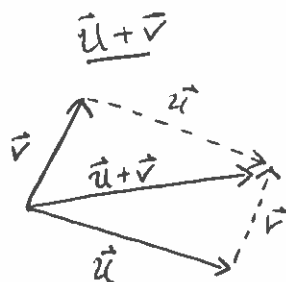
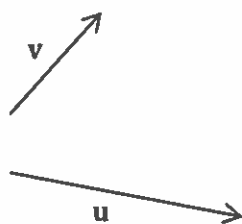
**Problem 1 (10 points)**

- a) Compute the sum and the difference of the vectors  $\langle 9, 3, -1 \rangle$  and  $\langle 2, -2, 10 \rangle$ .

$$\langle 9, 3, -1 \rangle + \langle 2, -2, 10 \rangle = \langle 9+2, 3+(-2), -1+10 \rangle = \langle 11, 1, 9 \rangle$$

$$\langle 9, 3, -1 \rangle - \langle 2, -2, 10 \rangle = \langle 9-2, 3-(-2), -1-10 \rangle = \langle 7, 5, -11 \rangle$$

- b) Copy the vectors in the figure and use them to draw the vectors  $\mathbf{u} + \mathbf{v}$  and  $\mathbf{u} - \mathbf{v}$ .



**Problem 2 (10 points)**

- a) Find an equation of the sphere with radius 3 and center  $C(2,3,4)$ .

$$(x-h)^2 + (y-l)^2 + (z-k)^2 = r^2$$

$$(x-2)^2 + (y-3)^2 + (z-4)^2 = 9$$

- b) Find an equation of the sphere through the point  $A(5,4,2)$  with center  $C(2,3,4)$ .

We want radius = distance from center to the given point.

$$r = \sqrt{(5-2)^2 + (4-3)^2 + (2-4)^2}$$

$$= \sqrt{3^2 + 1^2 + 2^2}$$

$$= \sqrt{9+1+4}$$

$$= \sqrt{14}$$

$$(x-h)^2 + (y-l)^2 + (z-k)^2 = r^2$$

$$(x-2)^2 + (y-3)^2 + (z-4)^2 = (\sqrt{14})^2$$

$$(x-2)^2 + (y-3)^2 + (z-4)^2 = 14$$