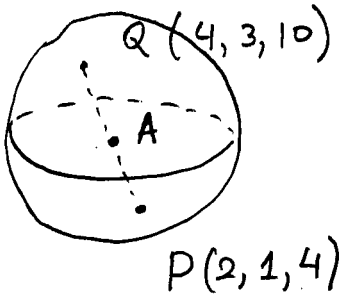
Wed Sept 4, 2013 MATH 250, Quiz 1 Prof. V. Panferov

Name (print): Solutions.

Each problem is worth 2 points. Show all your work.

1. Find an equation of a sphere if one of its diameters has endpoints $P(2,1,4)$ and $Q(4,3,10)$.



Diameter:

$$|PQ| = \sqrt{(4-2)^2 + (3-1)^2 + (10-4)^2}$$

$$= \sqrt{44} = 2\sqrt{11}.$$

Radius of the sphere:

$$r = \frac{1}{2}|PQ| = \sqrt{11}.$$

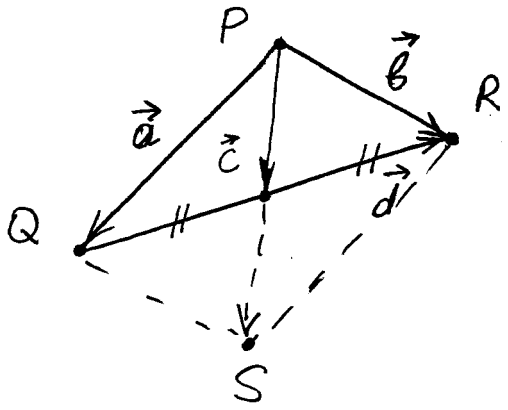
Center of the sphere — midpoint between P and Q $\Rightarrow$ $A\left(\frac{4+2}{2}, \frac{1+3}{2}, \frac{4+10}{2}\right) = A(3,2,7)$.

Sphere:

$$(x-3)^2 + (y-2)^2 + (z-7)^2 = 11.$$

Please turn over...

2. In the figure, the tip of $\vec{c}$ and the tail of $\vec{d}$ are both the midpoint of QR. Express the vectors $\vec{c}$ and $\vec{d}$ in terms of $\vec{a}$ and $\vec{b}$.



$$\vec{PS} = \vec{a} + \vec{b}$$
$$\vec{QR} = \vec{b} - \vec{a}$$
$$\Rightarrow \vec{c} = \frac{1}{2}(\vec{a} + \vec{b})$$
$$\vec{d} = \frac{1}{2}(\vec{b} - \vec{a}).$$

3. Find $|\vec{a} - \vec{b}|$:

$$\vec{a} = \vec{i} + 2\vec{j} - 3\vec{k}, \qquad \vec{b} = -2\vec{i} - \vec{j} + 5\vec{k}.$$

$$\vec{a} - \vec{b} = -3\vec{i} - 3\vec{j} + 8\vec{k}$$

$$|\vec{a} - \vec{b}| = \sqrt{3^2 + 3^2 + 8^2} = \sqrt{9 + 9 + 64} = \sqrt{82}.$$