TRANSFORMATIONS OF SPHERES - ANSWERS

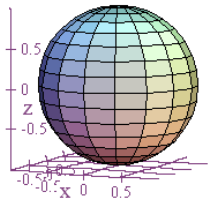
For each item below, find the vector-valued function $\vec{r}(s,t) = x(s,t)\hat{i} + y(s,t)\hat{j} + z(s,t)\hat{k}$, with $0 \le s \le \pi$ and $0 \le t \le 2\pi$, that gives the specified graph. Specify the ranges for your parameters.

1. the sphere of radius 1 with center at the origin

$\vec{r}(s,t) = \sin(s)\cos(t)\hat{i} + \sin(s)\sin(t)\hat{j} + \cos(s)\hat{k}$

$0 \le s \le \pi$

$0 \le t \le 2\pi$

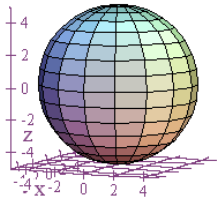


2. the sphere of radius 5 with center at the origin

$\vec{r}(s,t) = 5\sin(s)\cos(t)\hat{i} + 5\sin(s)\sin(t)\hat{j} + 5\cos(s)\hat{k}$

$0 \le s \le \pi$

$0 \le t \le 2\pi$

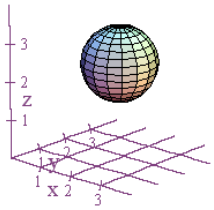


3. the sphere of radius 1 with center at $(1,3,2)$

$\vec{r}(s,t) = [1+\sin(s)\cos(t)]\hat{i} + [3+\sin(s)\sin(t)]\hat{j} + [2+\cos(s)]\hat{k}$

$0 \le s \le \pi$

$0 \le t \le 2\pi$

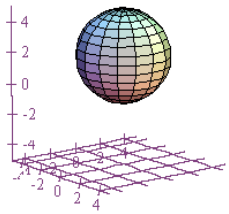


4. the sphere of radius 3 with center at $(0,0,2)$

$\vec{r}(s,t) = 3\sin(s)\cos(t)\hat{i} + 3\sin(s)\sin(t)\hat{j} + [2+3\cos(s)]\hat{k}$

$0 \le s \le \pi$

$0 \le t \le 2\pi$



5. the sphere of radius 3 with center at $(-1,0,1)$

$$\vec{r}(s,t) = \left[-1+3\sin(s)\cos(t)\right]\hat{i} + 3\sin(s)\sin(t)\,\hat{j} + \left[1+3\cos(s)\right]\hat{k}$$

$$0 \le s \le \pi$$

$$0 \le t \le 2\pi$$