PRINT Your Name:____________________________________

Quiz 5, Spring, 2013

The quiz is worth 5 points. **Remove EVERYTHING from your desk except this quiz and a pen or pencil.** SHOW your work. Express your work in a neat and coherent manner.

Find the average y coordinate of the points on the semi-circle parameterized by $\overrightarrow{\boldsymbol{c}}:[0,\pi]\to\mathbb{R}^3$, where $\overrightarrow{\boldsymbol{c}}(\theta)=(0,a\sin\theta,a\cos\theta)$, for some positive number a.

Answer: The average of y is

$$\frac{\int_{\overrightarrow{\boldsymbol{c}}} y\,ds}{\int_{\overrightarrow{\boldsymbol{c}}} ds}=\frac{\int_0^\pi a\sin\theta||\overrightarrow{\boldsymbol{c}}\,'(\theta)||d\theta}{\int_0^\pi ||\overrightarrow{\boldsymbol{c}}\,'(\theta)||d\theta}=\frac{\int_0^\pi a^2\sin\theta d\theta}{\int_0^\pi a d\theta}=\frac{-a^2\cos\theta|_0^\pi}{a\theta|_0^\pi}=\frac{2a^2}{a\pi}=\boxed{\frac{2a}{\pi}}$$