Math 20E

August 14, 2013

Question 1 The speed of an object is constant. The object's

***A.** velocity and acceleration are perpendicular.

B. acceleration is zero.

C. velocity is constant.

D. both **B** and **C**.

Question 2 Given domains $D \subset \mathbb{R}^2$ and $S \subset \mathbb{R}^2$ and a one-to-one transformation $T : D \to S$ that maps D onto S. Then T can be used to change variables as follows:

A. $\displaystyle\iint_S f(x,y)\,dx\,dy = \iint_D f\left(T\left(u,v\right)\right)\,\left|\text{det}\left[\mathbf{D}T\left(u,v\right)\right]\right|\,du\,dv.$

B. $\displaystyle\iint_D f(u,v)\,du\,dv = \iint_S f\left(T\left(x,y\right)\right)\,\left|\text{det}\left[\mathbf{D}T\left(x,y\right)\right]\right|\,dx\,dy.$

C. $\displaystyle\iint_D f(u,v)\,du\,dv = \iint_S f\left(T^{-1}\left(x,y\right)\right)\,\left|\text{det}\left[\mathbf{D}T^{-1}\left(x,y\right)\right]\right|\,dx\,dy.$

D. Both **A** and **B**

***E.** Both **A** and **C**

Question 3 Let $\frac{\partial(x,y)}{\partial(u,v)}$ be the Jacobian determinant of a coordinate transformation $T : R \to S$. Then,

A. $\frac{\partial(x,y)}{\partial(u,v)}$ measures the distortion of areas in R after being mapped to S by the transformation.

B. a small rectangle in R with area $\Delta u \, \Delta v$ is mapped to a small region in S with area $\left|\frac{\partial(x,y)}{\partial(u,v)}\right| \Delta u \, \Delta v$, approximately.

C. when $T(u,v)$ is a linear transformation, $\frac{\partial(x,y)}{\partial(u,v)}$ is constant.

*__D.__ **A**, **B** and **C**

E. Neither **A**, **B** nor **C**: little can be said about $\frac{\partial(x,y)}{\partial(u,v)}$ with so little information available.