Math 20E

August 8, 2017

Question 1 Given a path $\mathbf{c}(t)$ in $\mathbb{R}^n$, its derivative $\mathbf{c}'(t)$ represents a tangent vector to the corresponding curve at all values of t where

A. the path $\mathbf{c}(t)$ is continuous.

B. the derivative $\mathbf{c}'(t)$ exists.

C. the derivative $\mathbf{c}'(t)$ is not zero.

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

***E.** **A**, **B** and **C**. If $\mathbf{c}'(t)$ exists at t, then $\mathbf{c}(t)$ is continuous at t.

Question 2 Given a real-valued function $f(x, y, z)$ (i.e., $f : \mathbb{R}^3 \to \mathbb{R}$), the gradient of f at (a, b, c) is

A. $\mathrm{D}f(a, b, c)$, the derivative of f at (a, b, c).

B. A vector that is normal to the level surface $f(x, y, z) = f(a, b, c)$.

C. A vector that that points in the direction of greatest increase of $f(x, y, z)$ from (a, b, c).

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

***E.** **A**, **B** and **C**.

Question 3 A particle follows a path $\mathbf{c}(t)$. Its velocity is $\mathbf{v}(t) = \mathbf{c}'(t)$, its acceleration is $\mathbf{a}(t) = \mathbf{v}'(t) = \mathbf{c}''(t)$, and its speed is $\|\mathbf{v}(t)\|$ (the magnitude of its velocity). If the speed of the particle is constant, then its

*__A.__ velocity and acceleration are orthogonal.

B. velocity is constant.

C. acceleration is zero.

D. path is a straight line.

E. **B** and **C**

Question 4 Consider the double integral $\iint_R xy\,dA$, where $R = [0,1] \times [0,2]$. Then,

A. $\iint_R xy\,dA = \int_{x=0}^{1} \int_{y=0}^{2} xy\,dy\,dx$

B. $\iint_R xy\,dA = \int_{y=0}^{2} \int_{x=0}^{1} xy\,dx\,dy$

C. $\iint_R xy\,dA = \left(\int_0^1 x\,dx\right)\left(\int_0^2 y\,dy\right)$

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

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