Math 20E

August 8, 2017
Question 1  Given a path $c(t)$ in $\mathbb{R}^n$, its derivative $c'(t)$ represents a tangent vector to the corresponding curve at all values of $t$ where

A. the path $c(t)$ is continuous.

B. the derivative $c'(t)$ exists.

C. the derivative $c'(t)$ is not zero.

D. B and C.

*E. A, B and C. If $c'(t)$ exists at $t$, then $c(t)$ is continuous at $t$. 
Question 2  Given a real-valued function \( f(x, y, z) \) (i.e., \( f : \mathbb{R}^3 \rightarrow \mathbb{R} \)), the gradient of \( f \) at \((a, b, c)\) is

A. \( Df(a, b, c) \), 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 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 \( c(t) \). Its velocity is \( v(t) = c'(t) \), its acceleration is \( a(t) = v'(t) = c''(t) \), and its speed is \( ||v(t)|| \) (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 \( \int\int_{R} xy \, dA \), where \( R = [0, 1] \times [0, 2] \). Then,

A. \( \int\int_{R} xy \, dA = \int_{y=0}^{1} \int_{x=0}^{2} xy \, dy \, dx \)

B. \( \int\int_{R} xy \, dA = \int_{x=0}^{2} \int_{y=0}^{1} xy \, dx \, dy \)

C. \( \int\int_{R} xy \, dA = \left( \int_{0}^{1} x \, dx \right) \left( \int_{0}^{2} y \, dy \right) \)

D. A and B

*E. A, B, and C