Lecture Questions II: 110.106 Calculus I (Bio & Soc Sci)

Professor Richard Brown

Mathematics Department

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Question 1

Determine the truth of the following two statements:

(1) For a function to be differentiable, it must be at least continuous.

(2) For a function to have a second derviative, it must at least have a first derivative.

A. Both are true.

B. (1) is true and (2) is false.

C. (1) is false and (2) is true.

D. Both are false.

Question 2

Let $f(x) = \sin x$, $g(x) = e^x$, $h(x) = \sqrt[3]{x}$, and $i(x) = x^2 - 2x$. Then the derivative

$$\frac{d}{dx}\left[f\left(g\left(h(i(x))\right)\right)\right]$$

is zero at which point in the domain of x:

A. $x = 0$.
B. $x = 1$.
C. $x = 2$.
D. $x = 3$.

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Follow up: Is the derivative undefined at one or more of these points?

Question 3

Recall that the exponential function $g(x) = e^{kx}$, $k \neq 0$ is always concave up, no matter the choice of k.

Let $f(x) = \log_a x$, for $a > 0$, $a \neq 1$. Which of the following statements is the only one that is true?

A. $f(x)$ is concave down on all of $(0, \infty)$.

B. $f(x)$ may be either concave down or concave up on all of $(0, \infty)$, depending on the choice of a.

C. $f(x)$ will be concave down on parts of the domain of f and concave up on other parts.

D. $f(x)$ is not twice differentiable, so it has no concavity.

E. All of the above statements are false.