Quiz 5.3

Name

1. Let f be the function defined by $f(x) = (x + x^2)\, e^{-2x}$. On which of the following open intervals is f increasing?

(A) $\left(-\infty, \frac{-3-\sqrt{5}}{2}\right)$ and $\left(\frac{-3+\sqrt{5}}{2}, \infty\right)$

(B) $(-\infty, -1)$ and $(0, \infty)$

(C) $\left(-\infty, -\frac{\sqrt{2}}{2}\right)$ and $\left(\frac{\sqrt{2}}{2}, \infty\right)$

(D) $\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$

2. Let f be the function with derivative given by $f'(x) = x^2 - (a+b)\,x + ab = (x-a)(x-b)$, where a and b are constants such that $a < b$. Which of the following statements is true?

(A) f is decreasing for $a < x < b$ because $f'(x) < 0$ for $a < x < b$.

(B) f is decreasing for $x < a$ and $x > b$ because $f'(x) < 0$ for $x < a$ and $x > b$.

(C) f is decreasing for $x < \frac{a+b}{2}$ because $f'(x) < 0$ for $x < \frac{a+b}{2}$.

(D) f is decreasing for $x < \frac{a+b}{2}$ because $f''(x) < 0$ for $x < \frac{a+b}{2}$.

3. Let f be the function with derivative given by $f'(x) = \sin x + \cos(2x) - \frac{\pi}{4}$ for $0 \le x \le \pi$. On which of the following intervals is f increasing?

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(A) $[0, 0.724]$ only

(B) $[0, 0.724]$ and $[2.418, 3.142]$

(C) $[0, 0.253]$ and $[1.571, 2.889]$

(D) $[0.724, 2.418]$