Quiz 03 – Version B Solutions

1. (5 points) Find dy/dx for $y = e^{\sin(4x)}$.

Apply the chain rule to the exponential, then to $\sin(4x)$:

$$\frac{dy}{dx} = e^{\sin(4x)} \cos(4x) \cdot 4 = \boxed{4e^{\sin(4x)} \cos(4x)}.$$

Rubric (5 points):

- **2 points:** Differentiate the outer exponential to obtain the factor $e^{\sin(4x)}$.
- **2 points:** Differentiate sine to obtain the factor $\cos(4x)$, retaining its inner argument.
- **1 point:** Include the inner derivative 4 as a factor.

2. (5 points) Let $f(x) = x \cos x$. Find $f''(x)$ and evaluate $f''(\pi)$.

By the product rule,

$$f'(x) = \cos x - x \sin x.$$

Differentiate once more, applying the product rule again:

$$f''(x) = -\sin x - (\sin x + x \cos x) = \boxed{-2 \sin x - x \cos x}.$$

Thus

$$f''(\pi) = -2 \sin \pi - \pi \cos \pi = \boxed{\pi}.$$

Rubric (5 points):

- **2 points:** Obtain $f'(x) = \cos x - x \sin x$ (1 point for each term, $\cos x$ and $-x \sin x$).
- **2 points:** Differentiate both terms of f' correctly to obtain $-\sin x - (\sin x + x \cos x)$ (1 point for differentiating the first term; 1 point for correctly differentiating the product term).
- **1 point:** Evaluate at $x = \pi$ ($\frac{1}{2}$ point for correct substitution of the exact trig values; $\frac{1}{2}$ point for the simplified result π).

Grading notes: Accept equivalent correct expressions and methods. Award full credit for correct requested answers even if intermediate work is omitted. For partial credit, award the points supported by the work shown; correct subsequent work after an earlier error can earn its corresponding points. Deduct for the same error only once.