

Quiz 1 RM Solutions

Please inform your TA if you find any errors in the quiz solutions.

1. (4 points)

1. (2 points) Is $\int_u^{u^3} e^{v^3} dv$ a function? If so, of what variable?

Solution: It is a function (of u).

2. (2 points) True or false? $\int (\sin(x^2) + x^2 \cos(x^2)) dx = x \sin(x^2) + C$.

Solution: False Taking the derivative of the right hand side (using the product rule and chain rule) we get

$$\frac{d}{dx} x \sin(x^2) = \sin(x^2) + 2x^2 \cos(x^2)$$

2. (6 points)

1. (3 points) Compute $\int \sin(3x) \cos(3x) dx$

Solution: $-\frac{1}{12} \cos(6x) + C$. Using the double angle theorem

$$\int \sin(3x) \cos(3x) dx = \int \frac{1}{2} \sin(6x) dx$$

Letting $u = 6x$, the latter integral equals

$$\frac{1}{12} \int \sin(u) du = \frac{-1}{12} \cos(u) + C = \frac{-1}{12} \cos(6x) + C$$

2. (3 points) Compute $\int x \sin(\pi x) dx$

Solution: Integration by parts gives

$$\int x \sin(\pi x) dx = x \cdot \frac{-1}{\pi} \cos(\pi x) - \int \frac{-1}{\pi} \cos(\pi x) dx = \frac{-1}{\pi} x \cos(\pi x) + \frac{1}{\pi^2} \sin(\pi x) + C$$