

MULTIPLE CHOICE QUESTIONS 10

1. What is

$$\lim_{y \rightarrow 1^-} \int_{\ln(y)}^0 \frac{x \ln(e^x - x + x^2)}{(y-1)^3} dx \quad ?$$

- (i) 0,
- (ii) $\frac{2}{3}$,
- (iii) $\frac{1}{3}$,
- (iv) $-\frac{2}{3}$.

2. Let \mathcal{D} the interior of the triangle with vertices $A = (0, 0)$, $B = (\pi, 0)$ et $C = (\pi, \pi)$. We define

$$I := \iint_{\mathcal{D}} x \cos(x+y) dy dx.$$

Which of the following assertions are corrects ?

- $I = -\frac{3\pi}{2}$.
 - There is $(x_0, y_0) \in \mathcal{D}$ such that $x_0 \cos(x_0 + y_0) = -\frac{3}{\pi}$.
- (i) TT,
 - (ii) TF,
 - (iii) FT,
 - (iv) FF.

3. What is

$$\lim_{y \rightarrow 0} \int_1^{\exp(y^2)} \frac{\cos(\sqrt{\ln(x)})}{\cos(y) - 1} dx \quad ?$$

- (i) 0,
- (ii) -1,
- (iii) -2,
- (iv) $\frac{1}{2}$.

4. Let $\mathcal{D} =]0, 4[\times]\frac{\sqrt{\pi}}{2}, \frac{\sqrt{3\pi}}{2}[$ and f the function defined over \mathcal{D} by

$$f(x, y) = \frac{xy \cos(y^2)}{\sin^2(y^2)(1+x^2)}.$$

What is

$$\iint_{\mathcal{D}} f(x, y) dx dy \quad ?$$

- (i) $\frac{\ln(4)}{2}$,
- (ii) $\frac{\ln(4)}{4}$,
- (iii) 0,
- (iv) it's not defined

5. What is

$$\int_0^3 \int_x^3 \frac{2y}{(1+y^2)^2} dy dx \quad ?$$

- (i) $-\frac{1}{3} + \arctan(3)$,
- (ii) $-\frac{1}{3} \times \arctan(3)$,
- (iii) $-\frac{3}{10} + \arctan(10)$,
- (iv) $-\frac{3}{10} + \arctan(3)$.

6. Let $\mathcal{D} = \{(x, y) \in \mathbb{R}^2 : 1 < xy < 2, x^2 < y < 2x^2\}$. What is

$$\iint_{\mathcal{D}} x^3 + y^3 dy dx \quad ?$$

- (i) $\frac{3}{4}$,
- (ii) 1,
- (iii) $\frac{36}{37}$,
- (iv) $\frac{37}{36}$.

7. Let $f : \mathbb{R}^2 \rightarrow \mathbb{R}$ defined by

$$f(x, y) = 4 + x^2 - y^2.$$

Let $\mathcal{D} = \{(x, y, z) \in \mathbb{R}^3 : 0 \leq x \leq 1, 0 \leq y \leq 2, 0 \leq z \leq f(x, y)\}$. What is the volume of \mathcal{D} ?

- (i) 6,
- (ii) 5,
- (iii) $\frac{14}{3}$,

(iv) $\frac{16}{3}$.

8. What is

$$\int_0^\pi \int_0^{\cos(\theta)} 4e^{\sin(\theta)} dr d\theta \quad ?$$

(i) $4e$,

(ii) 0 ,

(iii) $e - 4$,

(iv) $4(e - 1)$.

9. Let $\mathcal{D} = \{(x, y) \in \mathbb{R}^2 : 0 \leq x \leq 1, 0 \leq y \leq \sqrt{x}\}$. What is

$$\iint_{\mathcal{D}} f(x, y) dx dy,$$

where $f(x, y) = \frac{y}{x^2+1}$?

(i) $\frac{\ln(2)}{2}$,

(ii) $\frac{\ln(2)}{4}$,

(iii) $\frac{1}{4}$,

(iv) $\ln(2)$.

10. Let $f : \mathbb{R}^2 \rightarrow \mathbb{R}$ defined by $f(x, y) = 4xy$. Let $\mathcal{D} = \{(x, y) \in \mathbb{R}^2 : x \geq 0, 0 < y < \sqrt{4 - x^2}\}$ and set

$$\mathcal{A} = \{(x, y, z) \in \mathbb{R}^3 : (x, y) \in \mathcal{D}, 0 \leq z \leq f(x, y)\}.$$

What is the volume of \mathcal{A} ?

(i) $\frac{16}{3}$,

(ii) 8 ,

(iii) 2 ,

(iv) 16 .