Mohamed Khider University of Biskra

Faculty of Exact Sciences
Department of SM
University Year 2026/2027

Module: Maths 3
Level: 2^{nd} Year LMD
Specialty: Physics

Dirigated Work N°1

(SINGLE INTEGRALS)

Exercise 1 *Calculate the following integrals (Using a primitive):*

$$\int x^2 - 5x + \frac{4}{x^2}\, dx\,, \quad \int \frac{2x}{x^2+1} dx\,, \quad \int \frac{2x+\sqrt{x}}{x} dx, \quad \int_0^1 x^2\, e^{x^3}\, dx,$$

$$\int_5^2 4x^3(x^4 - \frac{1}{2})dx, \quad \int \frac{x^3}{(x^4+6)^2}\, dx$$

Exercise 2 *Calculate the following integrals (Using integration by parts):*

$$\int x^2 e^x\, dx, \quad \int_1^2 lnx\, dx, \quad \int x\, ln\,(x+1)\, dx, \quad \int_0^1 xe^{-x}\, dx\,,$$

$$\int ln^2 x\, dx$$

Exercise 3 *Calculate the following integrals (Using variable change):*

$$\int \frac{dx}{(2x+1)^2}\,, \quad \int_0^1 \frac{dx}{e^x+1}, \quad \int_2^3 \frac{dx}{\sqrt{x+1}}\,, \quad \int \frac{\ln x}{x} dx,$$

$$\int \frac{1}{x \ln x} dx, \quad \int xe^{-x^2}\, dx\,,$$

Exercise 4 *Let f be the function defined by:* $f(x) = \dfrac{x^3 - 3x}{(x-1)^2}$.

1. *Determine the domain of definition D_f.*
2. *Prove the existence of three real numbers a, b, c such that:*

$$f(x) = ax + b + \frac{c}{(x-1)^2}$$

3. *Deduce the primitives of f.*

Charged of courses

Dr. OUAAR, F

Mohamed Khider University of Biskra

Faculty of Exact Sciences
Department of SM
University Year 2026/2027

Module: Maths 3
Level: 2^{nd} Year LMD
Specialty: Physics

Dirigated Work N°2

(DOUBLE AND TRIPLE INTEGRALS)

Exercise 5 *Calculate the following integrals:*

$$\int_3^4\int_1^2 \frac{dxdy}{(x+y)^2}, \qquad \int_1^2\int_x^{x\sqrt{3}} xydxdy, \qquad \int_0^{2\pi}\int_{2\sin\theta}^{2} rdrd\theta, \qquad \int_0^1\int_{y-1}^{2y} xydxdy.$$

Exercise 6 *Define the integration limits for* $\iint_D f(x,y)dxdy$, D *being delimited by:*

a) $x=2, x=3, y=-1, y=5$ *b)* $y=0, y=1-x^2$

c) $x^2+y^2=4$ *d)* $y=\frac{2}{1+x^2}, y=x^2$

Exercise 7 *Calculate the following integrals:*

a) $\iint_D |x+y|\,dxdy$, *où* $D=\{(x,y)\in\mathbb{R}^2/\,|x|<1,|y|<1\}$.

b) $\iint_D \frac{1}{1+x^2+y^2}dxdy$, *où* $D=\{(x,y)\in\mathbb{R}^2/x^2+y^2<1\}$.

c) $\iint_D \frac{xy}{x^2+y^2}dxdy$, *où* $D=\{(x,y)\in\mathbb{R}^2/x>0,y>0,x+y<1\}$.

d) $\iint_D \sqrt{x^2+y^2}dxdy$, *où* $D=\{(x,y)\in\mathbb{R}^2/0<y<x<1\}$.

Exercise 8 *Calculate the area of the figure bounded by the curves:*

a) $D=\{(x,y)\in\mathbb{R}^2/y^2=2x, y=x\}$

b) $D=\{(x,y)\in\mathbb{R}^2/y=\sin x, y=\cos x, x=0\}$

c) $D=\{(x,y)\in\mathbb{R}^2/y^2=4x, x+y=3, y\geq 0\}$

d) $D=\{(x,y)\in\mathbb{R}^2/y^2=4x+4, y^2=-4x+4\}$

Exercise 9 *Calculate the volume bounded by the surfaces:*

a) $V=\left\{(x,y,z)\in\mathbb{R}^3/\frac{x^2}{9}+\frac{y^2}{16}+\frac{z^2}{25}=1\right\}$

b) $V=\{(x,y,z)\in\mathbb{R}^3/x^2+z^2=R^2, y^2+z^2=R^2\}$

Exercise 10 *Calculate the following integrals:*

$\iiint_V z dxdydz$ *où* $V = \{(x, y, z) \in \mathbb{R}^3 / x \geq 0, y \geq 0, z \geq 0, z \leq 1 - y^2 \text{ et } x + y \leq 1\}$

$\iiint_V xyz dxdydz$ *où* $V = \{(x, y, z) \in \mathbb{R}^3 / 0 < z < 1, x^2 + y^2 < z^2\}$

Charged of courses

Dr. OUAAR, F