Univerzitet u Sarajevu
Prirodno-matematički fakultet
Odsjek za fiziku

NASLOV

PODNASLOV

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Sarajevo, 2023.

Sadržaj

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1 Naslov

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1.1 Podnaslov

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1.1.1 Podpodnaslov

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2 Primjeri

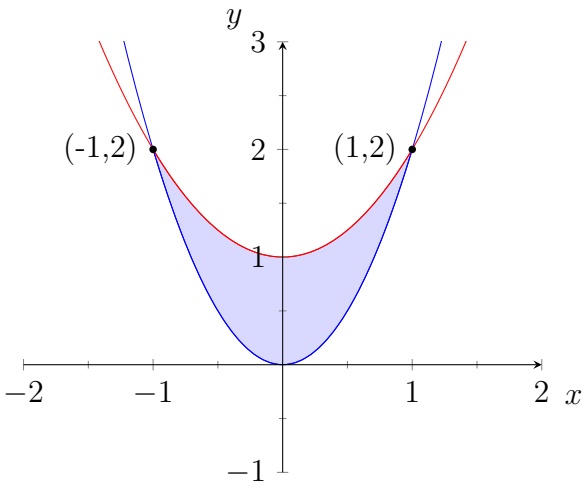
2.1 Slika

Slika 2.1: Logo PMF koji nije Word 2003 clip art

2.2 Zadatak

Zadatak 1 *Izračunati integral I ako je D oblast ograničena sa $y_1 = 2x^2$, $y_2 = 1 + x^2$.*

$$I = \iint_D (x + 2y)\ \mathrm{d}x\,\mathrm{d}y\,.$$



Slika 2.2: Slika uz zadatak 1

Prvi korak je odrediti granice: $2x^2 = 1 + x^2 \implies x = \pm 1$. Tačke presjeka su dakle $(1, 2)$ i $(-1, 2)$.

$$x\Big|_{-1}^{1}, \qquad y\Big|_{2x^2}^{1+x^2}.$$

$$
\begin{aligned}
I &= \int_{-1}^{1} \mathrm{d}x \int_{2x^2}^{1+x^2} (x+2y)\,\mathrm{d}y = \int_{-1}^{1} \mathrm{d}x \left(xy\Big|_{2x^2}^{1+x^2} + 2y^2\Big|_{2x^2}^{1+x^2} \right) \\
&= \int_{-1}^{1} \left\{ x(1+x^2-2x^2) + 2\left[(1+x^2)^2 - (2x^2)^2 \right] \right\} \mathrm{d}x \\
&= \ldots = \frac{32}{15}.
\end{aligned} \tag{1}
$$

2.3 Tabela

Value 1 α	**Value 2** β	**Value 3** γ
1	1110.1	a
2	10.1	b
3	23.113 231	c

Tabela 2.1: Tabela s paketom booktabs.

2.4 Kompleksnija tabela

m	$\mathrm{Re}\{\underline{\mathfrak{X}}(m)\}$	$-\mathrm{Im}\{\underline{\mathfrak{X}}(m)\}$	$\mathfrak{X}(m)$	$\frac{\mathfrak{X}(m)}{23}$	A_m	$\varphi(m)$ / °	φ_m / °
1	16.128	8.872	16.128	1.402	1.373	−146.6	−137.6
2	3.442	−2.509	3.442	0.299	0.343	133.2	152.4
3	1.826	−0.363	1.826	0.159	0.119	168.5	−161.1
4	0.993	−0.429	0.993	0.086	0.08	25.6	90
5	1.29	0.099	1.29	0.112	0.097	−175.6	−114.7
6	0.483	−0.183	0.483	0.042	0.063	22.3	122.5
7	0.766	−0.475	0.766	0.067	0.039	141.6	−122
8	0.624	0.365	0.624	0.054	0.04	−35.7	90
9	0.641	−0.466	0.641	0.056	0.045	133.3	−106.3
10	0.45	0.421	0.45	0.039	0.034	−69.4	110.9
11	0.598	−0.597	0.598	0.052	0.025	92.3	−109.3

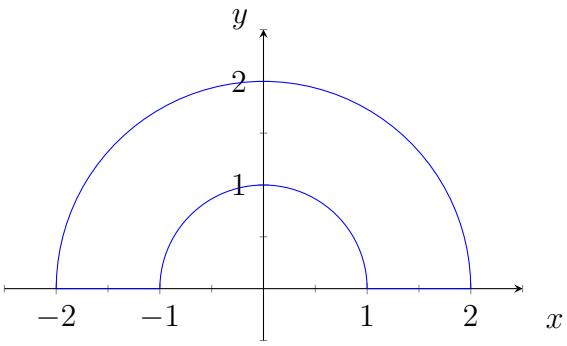
Tabela 2.2: Kompleksna tabela

2.5 Mjerne jedinice

Paket `siunits` dozvoljava da se lako i pravilno pišu veličine koje imaju mjerne jedinice. Kako se često pogrešno radi: $g = 9.81 ms^{-2}$. Kako je pravilno: $g = 9.81\,\mathrm{m\,s^{-2}}$.

2.6 Matematika

Zadatak 2 *Izračunati* $\oint y^2\,\mathrm{d}x + 3xy\,\mathrm{d}y$ *na konturi sa slike 2.3.*



Slika 2.3: Slika uz zadatak 2

$$\oint_C P\,\mathrm{d}x + Q\,\mathrm{d}y = \iint \left(\frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y}\right)\mathrm{d}x\,\mathrm{d}y$$

$$Q = 3xy, \qquad \frac{\partial Q}{\partial x} = 3y$$
$$P = y^2, \qquad \frac{\partial P}{\partial y} = 2y$$
$$r\Big|_1^2, \qquad \varphi\Big|_0^\pi$$

$$\oint_C = \iint_C (3y - 2y)\,\mathrm{d}x\,\mathrm{d}y = \iint_C y\,\mathrm{d}x\,\mathrm{d}y$$
$$= \int_1^2 \int_0^\pi r^2 \sin\varphi\,\mathrm{d}r\,\mathrm{d}\varphi = \frac{r^3}{3}\Big|_1^2 (-\cos\varphi)\Big|_0^\pi = \frac{14}{3}.$$

Zadatak 3 *Ako je vektorsko polje oblika* $\mathbf{F} = P\mathbf{i} + Q\mathbf{j} + R\mathbf{k}$ *dokazati da je* $\operatorname{div}\operatorname{rot}\mathbf{F} = 0$.

$$\operatorname{rot}\mathbf{F} = \left(\frac{\partial R}{\partial y} - \frac{\partial Q}{\partial z}\right)\mathbf{i} - \left(\frac{\partial R}{\partial x} - \frac{\partial P}{\partial z}\right)\mathbf{j} + \left(\frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y}\right)\mathbf{k}$$
$$\operatorname{div}\operatorname{rot}\mathbf{F} = \frac{\partial}{\partial x}\left(\frac{\partial R}{\partial y} - \frac{\partial Q}{\partial z}\right) - \frac{\partial}{\partial y}\left(\frac{\partial R}{\partial x} - \frac{\partial P}{\partial z}\right) + \frac{\partial}{\partial x}\left(\frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y}\right) = 0.$$