Odmah popuniti ↓ (50)

IME I PREZIME: IVES TOMIĆ BROJ INDEKSA:

OBAVEZNO POPUNITI VRIJEME RJEŠAVANJA ISPITA: DATUM OD DO .

MATEMATIKA 3: Trajanje 100 minuta. Ispit se održava sukladno objavljenim pravilima. Na snazi je Pravilnik o stegovnoj odgovornosti studenata. ooox

1. Primjenom Greenove formule izračunati integral

$$\oint_C y^2 \mathrm{d}x + (x+y)^2 \mathrm{d}y\,,$$

10

gdje je C kontura trokuta $A(0,0)$, $B(2,2)$ i $C(1,3)$ prijeđena u pozitivnom smislu (suprotno od kazaljke na satu).

2. Izračunati $\iint_{\partial K} \mathbf{F}\cdot \mathrm{d}\mathbf{S}$ gdje je $\mathbf{F} = \begin{pmatrix} x^2+y^2 \\ z \\ 1 \end{pmatrix}$ i $\partial K$ rub kugle $K$ radijusa 1 s centrom u točki $T(2,1,0)$, a koji je orijentiran vanjskom normalom.

3. Izračunati volumen tijela omeđenog plohama: $x^2+y^2+z^2=25$, $z=4$.

4. Izračunati

$$\int_{(1,\pi)}^{(2,3\pi)} 2x\sin y\,\mathrm{d}x + \left(x^2+1\right)\cos y\,\mathrm{d}y$$

20

5. Koristeći Laplaceovu transformaciju riješiti diferencijalnu jednadžbu:

$$f'''(t) - 4\,f'(t) = \cos(2t)\,,\quad f(0)=f'(0)=f''(0)=0.$$

20

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BROJ INDEKSA:

(5.) $f'''(t) - 4f'(t) = \cos(2t)$ $\quad f(0) = f'(0) = f''(0) = 0$

$f''' \Rightarrow s^3F(s) - \cancel{s^2 0} - \cancel{s\,0} - 0$

$f' \Rightarrow sF(s) - 0$

$s^3F(s) - 4sF(s) = \frac{s}{s^2+4}$

$F(s)(s^3 - 4s) = \frac{s}{s^2+4}$

$F(s) = \frac{s}{(s^3-4s)(s^2+4)} = \frac{s}{s\underbrace{(s^2-4)}_{(s-2)(s+2)}(s^2+4)} = \frac{A}{s} + \frac{B}{s-2} + \frac{C}{s+2} + \frac{Ds+E}{s^2+4}$

$s = As^4 - 16A + Bs(s+2)(s^2+4) + Cs(s-2)(s^2+4) + Ds^2(s^2-4) + Es(s^2-4)$

$s = As^4 - 16A + Bs^2 + 2Bs^3 + 8Bs + Cs^2 - 2Cs^3 - 8Cs + Ds^4 - 4Ds^2 + Es^3 - 4Es$

$0 = A + D$ $\quad 0 = 0 + D$

$0 = -16A$ $\quad \boxed{D = 0}$

$\boxed{A = 0}$

$0 = B + C - 4D$

$0 = 2B - 2C + E \quad / \cdot 4$

$1 = 8B - 8C - 4E$

$0 = 8B - 8C + \cancel{4E}$

$1 = 8B - 8C - \cancel{4E}$

$1 = 16B - 16C$

$0 = B + C \quad / \cdot 16$

$1 = 16B - 16C$

$0 = 16B + \cancel{16C}$

$1 = 16B - \cancel{16C}$

$1 = 16B$

$\boxed{B = \frac{1}{16}}$

$0 = B + C$

$0 = \frac{1}{16} + C$

$C = \frac{-1}{16}$

$0 = 2B - 2C + E$

$0 = \frac{2}{16} + \frac{2}{16} + E$

$0 = \frac{1}{8} + \frac{1}{8} + E$ $\quad 0 = \frac{2}{8} + E$ $\quad \boxed{E = \frac{-2}{8} = \frac{-1}{4}}$

IME I PREZIME: INES TOMIĆ BROJ INDEKSA:

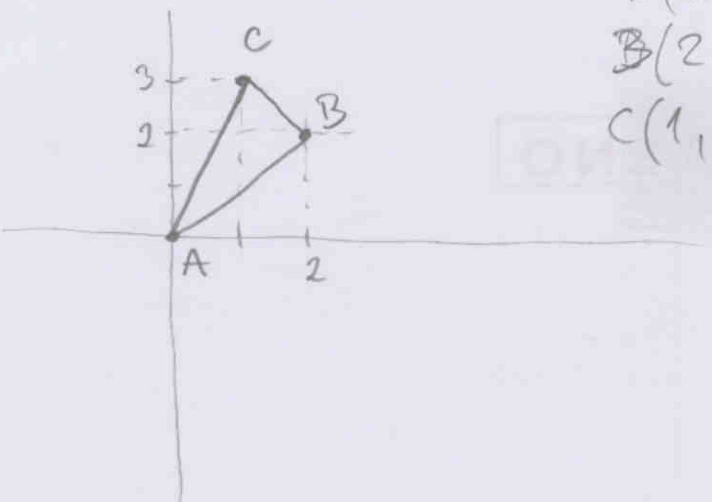
$$X(s) = \frac{1}{16}\frac{1}{s-2} - \frac{1}{16}\cdot\frac{1}{s+2} - \frac{1}{4}\cdot\frac{1}{s^2+4}$$

$$= \frac{1}{16}e^{2t} - \frac{1}{16}e^{-2t} - \frac{1}{4}\sin(2t) \checkmark \quad \underline{20}$$

1. $\oint_C \underbrace{y^2\,dx}_{P} + \underbrace{(x+y)^2}_{Q}dy$

$$\frac{dQ}{dx} = 2(x+y) \checkmark$$

$$\frac{dP}{dy} = 2y \checkmark$$




$A(\overset{x}{0},\overset{y}{0})$
$B(2,2)$
$C(1,3)$

AB

$$y - y_1 = \frac{y_2-y_1}{x_2-x_1}(x-x_1)$$

$$y - 0 = \frac{2-0}{2-0}(x-0)$$

$$y - 0 = \frac{2}{2}(x-0)$$

$$y - 0 = x - 0$$

$$\boxed{y = x}$$

$x=y$

AC

$$y - 0 = \frac{3-0}{1-0}(x-0)$$

$$y - 0 = \frac{3}{1}(x-0)$$

$$y - 0 = 3x$$

$$\boxed{y = 3x}$$

$x = \frac{y}{3}$

BC

$$y - 2 = \frac{3-2}{1-2}(x-2)$$

$$y - 2 = -(x-2)$$

$$y - 2 = -x + 2$$

$$y = -x + 2 + 2$$

$$\boxed{y = -x + 4}$$

$x = -y + 4$

**Ime i prezime:** INES TOMIĆ **Broj indeksa:**

$$\int_0^3\int_0^{-x+4} 2(x+y)-2y = \int_0^3\int_0^{-x+4} 2x+\cancel{2y}-\cancel{2y} =$$

$$=\int_0^3\int_0^{-x+4} 2x\,dx\,dy = \int_0^3 \cancel{2}\frac{x^2}{\cancel{2}}\Big|_0^{-x+4} dx\,dy$$

10

$$=\int_0^3 (-x+4)^2$$

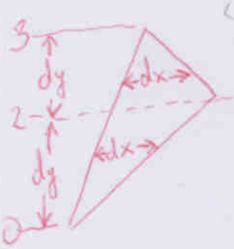
$$=\int_0^3 (-x^2-4x+4^2)$$

$$=\frac{x^3}{3}\Big|_0^3 - \cancel{4}^{2}\frac{x^2}{\cancel{2}}\Big|_0^3 + 16\Big|_0^3$$

$$=9-18+48$$

$$=39$$

$$\oint_C P\,dx+Q\,dy = \iint_{\text{TROKUT}} \underbrace{\left(\frac{\partial Q}{\partial x}-\frac{\partial P}{\partial y}\right)}_{=2x} dx\,dy$$




$$=\int_0^2\int_{\frac{y}{3}}^{y} 2x\,dx\,dy + \int_2^3\int_{\frac{y}{3}}^{-y+4} 2x\,dx\,dy$$

$= \dots$

(4.)

$$\begin{vmatrix} 2x\sin y \\ (x^2+1)\cos y \end{vmatrix}$$

$f(x,y) = -(x^2+1)\sin y$

$2\sin y$

$-(x^2+1)\sin y$

~~$2\sin\pi - 2\sin\pi$~~

$2\sin 3\pi - 5\sin 3\pi$

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$$f(1,\pi)-f(2,3\pi) = 0-0=0$$

Odmah popuniti ↓ 
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5) $f'''(t) - 4f'(t) = \cos(2t)$

$f(0)=0$
$f'(0)=0$
$f''(0)=0$

$s^3F(s) - s^2f(0) - sf'(0) - f''(0) - 4\left[sF(s) - f(0)\right] = \dfrac{s}{s^2+4}$

$s^3F(s) - 4F(s) = \dfrac{s}{s^2+4}$ ✓

$s$

$F(s)(s^3-4s) = \dfrac{s}{s^2+4}$ ✓

$F(s) = \dfrac{s}{s(s-2)(s+2)(s^2+4)}$ ✓

$(s^2-4)(s^2+4)$

$s^4-16$

$(s^2+2s)(s^2+4)$

$s^4+4s^2+2s^3+8s$

$(s^3-4s)(Ds+E)$

$\dfrac{A}{s} + \dfrac{B}{s-2} + \dfrac{C}{s+2} + \dfrac{Ds+E}{s^2+4}$

$\cancel{As^4} - 16A + \cancel{Bs^4} + \cancel{4Bs^2} + \cancel{2Bs^3} + \cancel{8Bs} + \cancel{Cs^4} + \cancel{4Cs^2} - \cancel{2Cs^3} - \cancel{8Cs}$
$+ \cancel{Ds^4} - \cancel{4Ds^2} + \cancel{Es^3} - 4Es$

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$s^4 (A+B+C+D)$

$s^3 (2B-2C+E)$

$s^2 (4B+4C-4D)$

$s (8B-8C-4E)$

$A+B+C+D=0$ (1)

$2B-2C+E=0$ (2)

$4B+4C-4D=0$ (3)

$8B-8C-4E=1$ (4)

$A=0$ (5)

$\boxed{A=0}$

$\boxed{E=-\frac{1}{4}}$

$\boxed{B=C}=0$

NE ZADOVOLJAVA JEDNADŽBU (2) $\Rightarrow F(s)=\frac{0}{s}+\frac{B}{s-2}+\frac{?}{s+2}+\frac{?s+?}{s^2+4}$

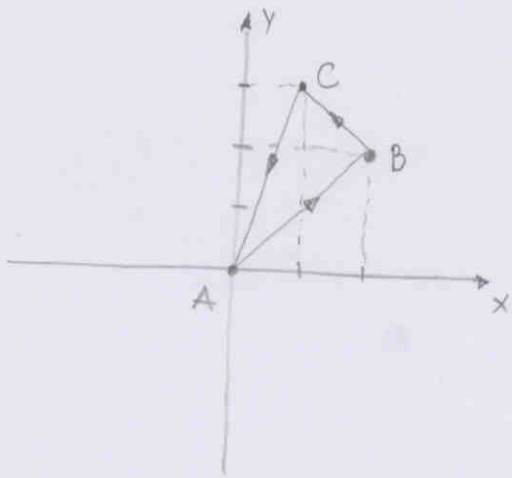
$f(t)=-\frac{1}{4}te^{-2t}$ ~~×~~

$\underline{10}$

1)

$$\oint_C y^2dx+(x+y)^2dy$$

A(0,0)
B(2,2)
C(1,3)

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