GABARITO DAS LISTAS DE EXERCÍCIOS - DISCIPLINA MTM 5163: CÁLCULO C

LISTA 1 - CURVAS

3. **(a)** $3t + t\sin t + 2t^2$;
   (b) $(te^{-t}, e^{-t}\sin t, 2e^{-t})$;
   (c) $(t-6, \sin t - 2t, 2-2t^2)$;
   (d) $(t^2\sin t - 2t, 6-t^3, t^2 - 3\sin t)$.

4. **(a)** $1+t$;
   (b) $(e^{-t}\sin t, e^{-t}\cos t, te^{-t})$;
   (c) $(-\sin t, -\cos t, t-2)$;
   (d) $((1-t)\cos t, (t-1)\sin t, 0)$.

5. **(a)** $(\frac{1}{2}, 1, 0)$;
   (b) $(1, 2, 0)$;
   (c) $(\frac{7}{3}, 1, 2)$.

6. **(a)** $\gamma'(t) = (6t, -e^{-t}, \frac{2t}{t^2+1})$ e $\gamma''(t) = (6, e^{-t}, -\frac{2}{t^2+1})$;
   (b) $\gamma'(t) = (\frac{2}{3}t^{-\frac{1}{3}}, -2t\sin(t^2), 3)$ e $\gamma''(t) = (-\frac{2}{9}t^{-\frac{4}{3}}, -2\sin 2t - 4t^2\cos t, 0)$;
   (c) $\gamma'(t) = (5\cos 5t, -4\sin 4t, 2e^{-2t})$ e $\gamma''(t) = (-25\sin 5t, -16\cos 4t, -4e^{-2t})$.

7. **(a)** $(\frac{1}{2}, e-1, 0)$;
   (b) $(0, \frac{\pi}{2}, 2)$;
   (c) $(3, 2, 1)$.

8. **(a)** $\frac{1}{2} + e$;
   (b) $(2-e, e-2, 0)$;

9. **(a)** $2\pi + \frac{8\pi^3}{3}$ e a curva é regular;
   (b) $\sqrt{5}$ e a curva é regular;
   (c) $\int_0^{\pi} \sqrt{1+e^{-2t}}dt$ e a curva é regular;
   (d) $\sqrt{3}(1-e^{-1})$ e a curva é regular;
   (e) $\int_1^e \frac{1}{t}\sqrt{t^2+1}dt$ e a curva é regular.

10. Dom $\gamma = (0, 1]$ e $\gamma(\frac{3}{5}) = (\ln\frac{3}{5}, \frac{4}{5}, \frac{9}{25})$.

Lista 2 - Campos vetoriais

1. **(a)** $\gamma'(t) = 2te^{t^2}\frac{\partial f}{\partial x}(e^{t^2}, \sin t) + \cos t \frac{\partial f}{\partial y}(e^{t^2}, \sin t)$;

   (b) $\gamma'(0) = 1$.

2. **(a)** $\gamma'(t) = 3\frac{\partial f}{\partial x}(3t, 2t^2 - 1) + 4t\frac{\partial f}{\partial y}(3t, 2t^2 - 1)$;

   (b) $\gamma'(0) = 1$.

5. **(a)** $-\frac{2}{\sqrt{5}}$;

   (b) $-\frac{2}{5}$;

   (c) 0;

   (d) $\sqrt{2}$.

6. **(a)** $\vec{v}$ é o versor de $\nabla f(x_0, y_0)$;

   (b) $\vec{v}$ é o versor de $-\nabla f(x_0, y_0)$;

   (c) nas direções ortogonais a $\nabla f(x_0, y_0)$.

7. **(a)** $(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$ e $(-\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}})$;

   (b) $(\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}})$ e $(-\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$;

   (c) $(-\frac{2\sqrt{11}}{5}, -\frac{\sqrt{11}}{5})$ e $(\frac{2\sqrt{11}}{5}, \frac{\sqrt{11}}{5})$.

8. **(a)** $(xz - 2yz)\vec{i} - yz\vec{j} - x\vec{k}$;

   (b) $2\vec{k}$;

   (c) $-2y\vec{k}$;

   (d) $-3x\vec{k}$;

   (e) 0.

9. rot $\vec{F} = \frac{\partial Q}{\partial z}(x, y, z)\vec{i}$.

10. **(a)** $f(x, y) = -3x^2 - y^2$;

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

    (c) não existe.

Lista 3 - Intergrais de linha de campos vetoriais

1. **(a)** $2\pi^2$;

   (b) $-\frac{11}{6}$;

   (c) $\frac{8\pi^3}{3}$;

   (d) 0;

   (e) $\frac{\pi^3}{3} + 2$.

2. $\int_\gamma \vec{F} \cdot d\vec{r} = 0$.

3. O trabalho é $\int_\gamma \vec{F} \cdot d\vec{r} = 1$.

4. **(a)** $2\pi(1 + \pi)$;

   (b) $\frac{13}{2}$;

   (c) 0.

5. $8\pi^4$.

6. $-\frac{5}{2}$.

7. $\frac{3}{2}$.

8. $\frac{1}{6}$.

11. 0.

12. 4.

13. $\frac{14}{3}$.

14. 0.

Lista 4 - Teorema de Green

1. $-A(B)$, onde $A(B)$ é a área de B.

2. 24.

3. 2π.

4. $\frac{5}{12}$.

5. 0.

6. 0.

7. $8\ln 2$.

Lista 5 - Intergrais de linha de campos escalares

1. **(a)** $\frac{4}{3}\sqrt{2}$;

   (b) $-\sqrt{2}$;

   (c) $-\frac{\pi\sqrt{2}}{2}$.

2. $\sqrt{2}(\pi + \frac{\pi^3}{3})$.

3. $\pi\delta r^3$, onde δ é a densidade constante do fio.

4. $\frac{15\sqrt{14}}{2}$.

5. **(a)** $(x_c, y_c, z_c) = (\frac{2}{\pi}, \frac{2}{\pi}, \frac{\pi}{4})$.

   (b) $(x_c, y_c, z_c) = (0, \beta, 0)$, onde $\beta = \dfrac{\int_0^1 t^2\sqrt{1+4t^2}dt}{\int_0^1 \sqrt{1+4t^2}dt}$.

   Ainda, $\int_0^1 \sqrt{1+4t^2}dt = \frac{\sqrt{5}}{2} + \ln(2+\sqrt{5})$.

6. $(\frac{4}{5}, \frac{4}{5}, \frac{4}{5})$.

Lista 6 - Intergrais de superfícies

1. $\frac{2}{3}\pi(2\sqrt{2}-1)$.

2. **(a)** $\frac{8}{3}\pi R^4$;

   (b) $\frac{4}{3}$;

   (c) $\frac{\sqrt{2}}{10}(3\sqrt{3}-2)$;

   (d) $\frac{\sqrt{14}}{6}$;

   (e) $\frac{1}{24}(5\sqrt{5}-1)$.

3. $-\frac{1}{2}$;

Lista 7 - Teoremas de Gauss e Stokes

1. 0

2. 36π

3. 0 se a origem está fora da esfera, 4π se a origem está no interior da esfera.

5. **(a)** 0;

   (b) $-\frac{5}{6}$;

   (c) 0);

   (d) 4π;

6. 0.