Iniciada	segunda, 13 de julho de 2020 às 09:45
Estado	Terminada
Terminada em	segunda, 13 de julho de 2020 às 12:09
Tempo gasto	2 horas 23 minutos
Nota	**6,250** num máximo de 20,000 (**31**%)

Informação

Instituto Superior de Engenharia de Coimbra

Licenciaturas em Engenharia Informática

Análise Matemática II

Exame da época de recurso

Data: 13/07/2020 **Duração:** 150 minutos

Pergunta 1

Respondida

Sem avaliação

Nome Completo:
Número de aluno:
Curso:

Notas:
i) Caso pretenda desistir deve escrever neste espaço o texto seguinte:
"Declaro que desisto"
Data: Hora:
ii) Se não fizeram nada ou praticamente nada cuja soma das cotações seja muito baixa, o melhor mesmo e aconselhável é desistirem.
iii) Não facilitem, não esgotem totalmente o tempo de prova e não a submetam apenas nos últimos segundos.
iv) No final de concluir a prova deve selecionar o botão "terminar e submeter" existente na última página

Ana Rita Santos Videira

201 501 22 18

Engenharia Informática - Curso Europeu

Pergunta 2

Parcialmente correta

Nota: 0,300 em 3,000

Considere a equação diferencial $\frac{\mathrm{d}y}{\mathrm{d}x} + (x^2 - 3)y = A(x, y)$

(a) A Equação diferencial é uma EDO de 1ª ordem.

True

Your last answer was interpreted as follows: $\mathbf{true}$

Correct answer, well done.

(b) Para $A(x, y) = x^2 - 3$:

(i) A equação diferencial não é linear e de 1ª ordem.

True

Your last answer was interpreted as follows: $\mathbf{true}$

Incorrect answer.

(ii) Determine a solução geral da ED e introduza a constante com %c.

$y = f(x; c) \Leftrightarrow$ 2*x + %c

Your last answer was interpreted as follows: $2 \cdot x + \%c$

The variables found in your answer were: $[\%c, x]$

Incorrect answer.

Your answer should be an equation, but is not.

(c) Para $A(x, y) = 0$

(i) determine a solução particular da equação diferencial que satisfaz a a condição inicial $y(0) = 2$.

$y = f(x) \Leftrightarrow$ x^2= 3

Your last answer was interpreted as follows: $x^2 = 3$

The variables found in your answer were: $[x]$

Incorrect answer.

(ii) Sendo a figura 1 o gráfico e campo direcional da ED, qual das figuras 2 ou 3 é o gráfico da sua solução geral?

Figura = 2

Your last answer was interpreted as follows: 2

Incorrect answer.

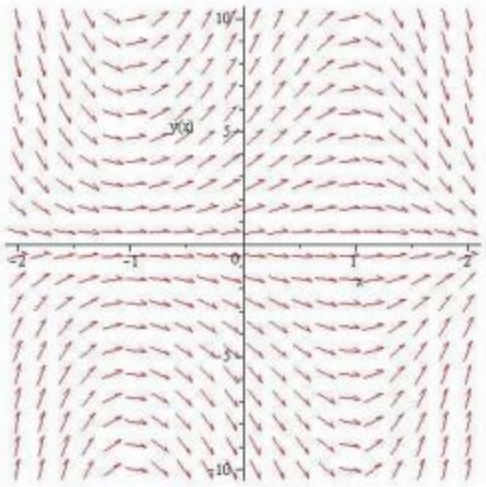


Figura 1

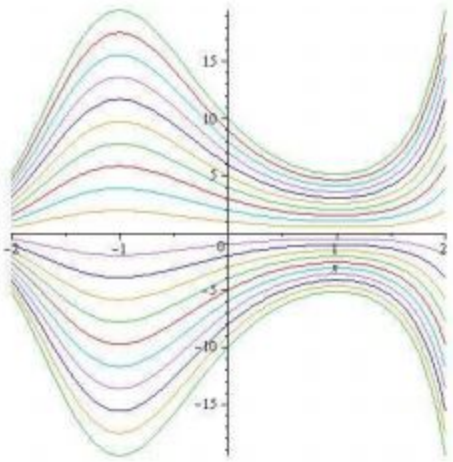


Figura 2

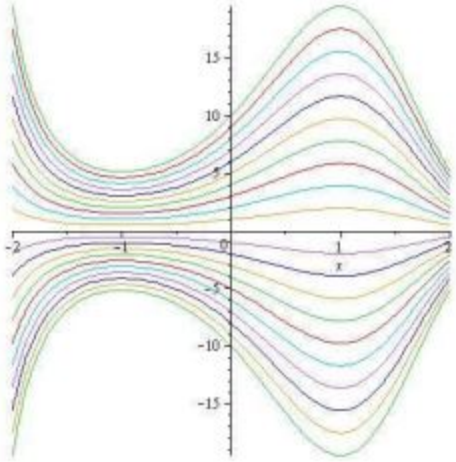


Figura 3

A correct answer is **true**.

A correct answer is **false**.

A correct answer is $y = e^{3 \cdot x - \frac{x^3}{3}} \cdot \left(e^{\frac{x^3}{3} - 3 \cdot x} + \%c \right)$, which can be typed in as follows: `y = %e^(3*x-x^3/3)*(%e^(x^3/3-3*x)+%c)`

A correct answer is $y = 2 \cdot e^{3 \cdot x - \frac{x^3}{3}}$, which can be typed in as follows: `y = 2*%e^(3*x-x^3/3)`

A correct answer is 3, which can be typed in as follows: `3`

Pergunta 3

Parcialmente correta

Nota: 1,500 em 3,000

Considere o sistema de funções $\mathrm{SF}=\left\{ {e^{5\cdot x}},{x\cdot e^{5\cdot x}} \right\}$.

(a) Calcule o Wronskiano do sistema de funções SF.

$\mathrm{det}\left(W \right)=$ e^(10*x)

Your last answer was interpreted as follows: $e^{10\cdot x}$

The variables found in your answer were: $\left[x \right]$

Correct answer, well done.

(b) SF constitui um Sistema Fundamental de Soluções (SFS) de uma equação diferencial de ordem 2, linear e homogénea?

True

Your last answer was interpreted as follows: $\mathbf{true}$

Correct answer, well done.

(c) As funções de SF são soluções da equação diferencial $y''-{10}y'+{5}y=0$.

True

Your last answer was interpreted as follows: $\mathbf{true}$

Incorrect answer.

(d) Determine a solução geral da equação diferencial $y''-{10}y'+{25}y=0$.

$y=c_1\ast$ e^((5 - 2* sqrt(5)) * x)

Your last answer was interpreted as follows: $e^{\left(5-2\cdot \sqrt{5}\right)\cdot x}$

The variables found in your answer were: $\left[x \right]$

Incorrect answer. $+ c_2\ast$ e^((5 + 2* sqrt(5)) * x)

Your last answer was interpreted as follows: $e^{\left(5+2\cdot \sqrt{5}\right)\cdot x}$

The variables found in your answer were: $\left[x \right]$

Incorrect answer. $\mathrm{com}\,\,c_1, c_2\,\in\mathbb{R}$.

A correct answer is $e^{5\cdot x}\cdot \left(5\cdot x\cdot e^{5\cdot x}+e^{5\cdot x}\right)-5\cdot x\cdot e^{10\cdot x}$, which can be typed in as follows: `%e^(5*x)*(5*x*%e^(5*x)+%e^(5*x))-5*x*%e^(10*x)`

A correct answer is \(\mathbf{true} \).

A correct answer is \(\mathbf{false} \).

A correct answer is \(e^{5\cdot x} \), which can be typed in as follows: `%e^(5*x)`

A correct answer is \(x\cdot e^{5\cdot x} \), which can be typed in as follows: `x*%e^(5*x)`

Pergunta 4

Parcialmente correta

Nota: 1,000 em 4,000

Considere o PVI de ordem 2 definido por:

\(\displaystyle \left (\mathrm{P} \right)\left\{\begin{matrix}
y''+{4}y=0\\
y(0)=1\\
y'(0)=0
\end{matrix}\right. \)

(a) Determine a solução particular de P.

\(\displaystyle y=y(t)\Leftrightarrow \) `y = (e^(2*t) /2) + (e^(-2*t) /`

Your last answer was interpreted as follows: \(y=\frac{e^{2\cdot t}}{2}+\frac{e^ {- 2\cdot t }}{2} \)

The variables found in your answer were: \(\left[t , y \right]\)

(b) Transforme o problema diferencial P num PVI de ordem 1, isto é, com um sistema de duas equações diferenciais de ordem 1.

\(\displaystyle \left (\mathrm{Q} \right) \left\{\begin{matrix} \left\{\begin{matrix} u'=f(t,u,v) \\ v'=g(t,u,v) \end{matrix}\right. \\u(0)=1 \\ v(0)=0 \end{matrix}\right. \)

\(\displaystyle f(t,u,v)=\) `v`

Your last answer was interpreted as follows: \(v \)

The variables found in your answer were: \(\left[v \right]\)

\(\displaystyle g(t,u,v)=\) `4*u`

Your last answer was interpreted as follows: \(4\cdot u \)

The variables found in your answer were: \(\left[u \right]\)

Your answer is partially correct.

Incorrect answer.

Correct answer, well done.

Incorrect answer.

A correct answer is \(y=\cos \left(2\cdot t \right) \), which can be typed in as follows: `y = cos(2*t)`

A correct answer is \(v \), which can be typed in as follows: `v`

A correct answer is \(-4\cdot u \), which can be typed in as follows: `-(4*u)`

Pergunta 5

Parcialmente correta

Nota: 2,750 em 5,000

Considere as funções reais de duas variáveis reais definidas por:

$f(x,y)=y^2+x^2$, $g(x,y)=\frac{1}{4}(y^2+x^2)$, se $x^2+y^2\le 16$, $h(x,y)=2\sqrt{x^2+y^2}-4$, se $1\le x^2+y^2\le 4$

a) Determine as derivadas parciais seguintes:

$\frac{\partial h}{\partial x}\left(x,y\right)=$ 2*y / (sqrt((y^2)- 4))

Your last answer was interpreted as follows: $\frac{2\cdot y}{\sqrt{y^2-4}}$

The variables found in your answer were: $\left[y \right]$

Incorrect answer.

$\frac{\partial g}{\partial y}\left(x,y\right)=$ (1/4) * 2*y + %c

Your last answer was interpreted as follows: $\frac{1}{4}\cdot 2\cdot y+{\it \%c}$

The variables found in your answer were: $\left[{\it \%c} , y \right]$

Incorrect answer.

b) Determine a equação da reta tangente à curva C de interseção da superfície de equação $z=g(x,y)$ com o plano $x={2}$ no ponto $P(x,y)=({2},{2})$.

i) Qual é o declive da reta tangente à curva C no ponto P? $m_t=$ 1

Your last answer was interpreted as follows: 1

Correct answer, well done.

ii) A equação da reta tangente é dada por: $x={2}\ \land\ z=$ 2

Your last answer was interpreted as follows: 2

Incorrect answer.

c) A temperatura de uma placa de metal aquecida é dada por $T(x,y) = {y^2+x^2}$.
Determine a taxa de variação de T em relação à distância no ponto no ponto $P(x,y)=({2},{2})$ na direção:

i) do eixo dos xx = 4

Your last answer was interpreted as follows: 4

Correct answer, well done.

ii) do eixo dos yy = 4

Your last answer was interpreted as follows: 4

Correct answer, well done.

iii) do vetor que faz um ângulo de 30° com a direção positiva do eixo dos xx = 2*sqrt(3) + 2

Your last answer was interpreted as follows: \(2\cdot \sqrt{3}+2 \)

Correct answer, well done.

d) Se \(\displaystyle z={2\cdot \sqrt{y^2+x^2}-4},\, \, x=\rho\cos(\theta),\,\, y=\rho\sin(\theta) \Rightarrow \frac{\partial^2 z}{\partial \theta^2}+\frac{\partial z}{\partial \rho}=\left (\frac{\partial z}{\partial y} \right)^2+\left (\frac{\partial z}{\partial x} \right)^2\)

False

Your last answer was interpreted as follows: \(\mathbf{false} \)

Correct answer, well done.

e) O domínio da função \(h\) é um círculo fechado.

True

Your last answer was interpreted as follows: \(\mathbf{true} \)

Incorrect answer.

(f) Das figuras seguintes qual delas é o gráfico da função:

i) \(\displaystyle z=g(x,y)\rightarrow \) Figura = 2

Your last answer was interpreted as follows: \(2 \)

Incorrect answer.

ii) \(\displaystyle z=h(x,y)\rightarrow \) Figura = 3

Your last answer was interpreted as follows: \(3 \)

Incorrect answer.

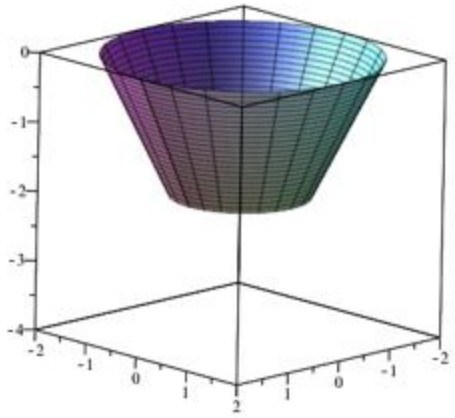


Figura 1

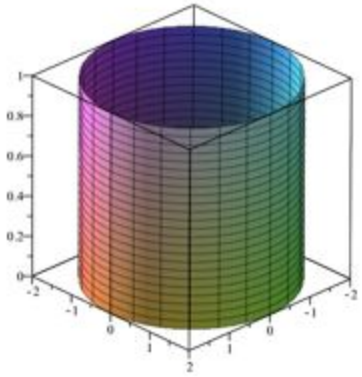


Figura 2

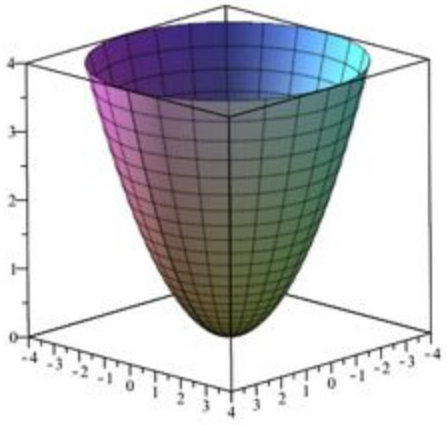


Figura 3

A correct answer is \(\frac{2\cdot x}{\sqrt{y^2+x^2}} \), which can be typed in as follows: `(2*x)/sqrt(y^2+x^2)`

A correct answer is \(\frac{y}{2} \), which can be typed in as follows: `y/2`

A correct answer is \(1 \), which can be typed in as follows: `1`

A correct answer is \(y \), which can be typed in as follows: `y`

A correct answer is \(4 \), which can be typed in as follows: `4`

A correct answer is \(4 \), which can be typed in as follows: `4`

A correct answer is \(2\cdot \sqrt{3}+2 \), which can be typed in as follows: `2*sqrt(3)+2`

A correct answer is \(\mathbf{false} \).

A correct answer is \(\mathbf{false} \).

A correct answer is \(3 \), which can be typed in as follows: `3`

A correct answer is \(1 \), which can be typed in as follows: `1`

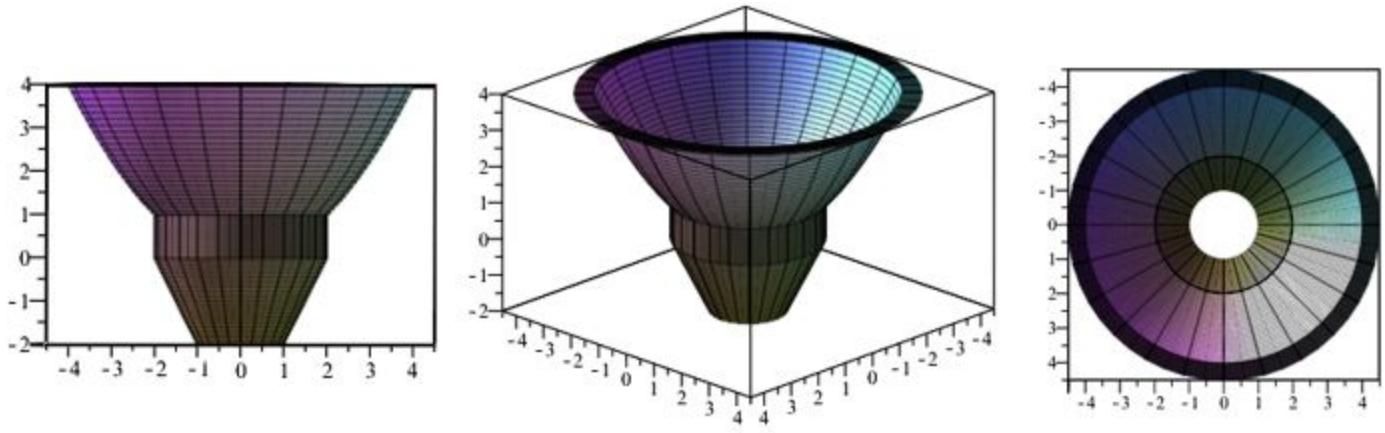
Pergunta 6

Parcialmente correta

Nota: 0,700 em 5,000

A figura seguinte representa um prototipo de uma **enchedeira** que é uma espécie de funil para encher chouriças e outro fumeiro.
O sólido é composto por 4 partes, a saber:

- Tronco de um cone de altura \(h=4\) e raio \(r=2\);
- Cilindro de raio \(r=2\) e altura \(h=1\);
- Segmento de um paraboloide de altura \(h=4\) e largura máxima de raio \(r=4\);
- Anel circular de largura \(l=\frac{1}{2}\).



(a) Associando os conjuntos seguintes a sistemas de coordenadas 3D, complete-os de forma a definir corretamente o sólido \(\displaystyle S=S_1\cup S_2 \cup S_3\cup S_4 \):

\(\displaystyle S_1=\left \{ (\rho,\theta,z):r_1\leq \rho \le 2\,\wedge 0\leq \theta\leq \theta_2 \, \wedge \, z=z(\rho,\theta) \right \}\)

\(\displaystyle r_1 =\) 0

Your last answer was interpreted as follows: \(0 \)

Incorrect answer.

\(\displaystyle \theta_2 =\) 2*pi

Your last answer was interpreted as follows: \(2\cdot \pi \)

Correct answer, well done.

\(\displaystyle z(\rho,\theta) =\) x^2 + y^2

Your last answer was interpreted as follows: \(x^2+y^2 \)

The variables found in your answer were: \(\left[x , y \right]\)

Incorrect answer.

$S_2=\left \{ (x,y,z)\in\mathbb{R}^3:x^2+y^2\leq 4\,\wedge 0\leq z\leq z_1\right \}$

$z_1 =$ 1

Your last answer was interpreted as follows: 1

Correct answer, well done.

$S_3=\left \{ (\rho,\theta,z): r_1\leq \rho\le r_2\,\wedge 0\leq \theta\leq 2\pi \, \wedge \, z=z(\rho,\theta) \right \}$

$r_1 =$ 0

Your last answer was interpreted as follows: 0

Incorrect answer.

$r_2 =$ 4

Your last answer was interpreted as follows: 4

Correct answer, well done.

$z(\rho,\theta) =$ sqrt(x^2 + y^2)

Your last answer was interpreted as follows: $\sqrt{x^2+y^2}$

The variables found in your answer were: $\left[x , y \right]$

Incorrect answer.

$S_4=\left \{ (x,y,z): r_1\leq x^2+y^2\le r_2\, \wedge z=z(x,y) \right \}$

$r_1=$ 0

Your last answer was interpreted as follows: 0

Incorrect answer.

$r_2 =$ 1/2

Your last answer was interpreted as follows: $\frac{1}{2}$

Incorrect answer.

\(\displaystyle z(x,y) =\) x^2 + y^2

Your last answer was interpreted as follows: \(x^2+y^2 \)

The variables found in your answer were: \(\left[x , y \right]\)

Incorrect answer.

(b) Determine o volume que "ocupa" um pedaço de carne compactada de porco bísaro dentro desta enchedeira (capacidade da enchedeira) e a massa do anel superior da enchedeira sabendo que a sua densidade é \(\displaystyle \rho(x,y)={3}\)

Nota: por uma questão de simplificação dos cálculos para o cálculo do volume da carne, considere que a espessura da enchedeira é desprezável.

(i) \(\displaystyle V(S)=V(S_1)+V(S_2)+V(S_3)\)

\(\displaystyle V(S_1) =\)

\(\displaystyle V(S_2) =\)

\(\displaystyle V(S_3) =\)

(ii) \(\displaystyle M(S_4) = \) 3* pi * (4 - 7/2)

Your last answer was interpreted as follows: \(3\cdot \pi\cdot \left(4-\frac{7}{2}\right) \)

Incorrect answer.

(c) Defina \(S_4\) em coordenadas cilíndricas completando o conjunto seguinte:

\(\displaystyle S_4=\left \{ (\rho,\theta,z): \rho_1\leq \rho\le \rho_2\,\wedge \theta_1\leq \theta\leq \theta_2 \, \wedge \, z =z(\rho,\theta) \right \}\)

\(\displaystyle \rho_1 =\)

\(\displaystyle \rho_2 =\)

\(\displaystyle \theta_1 =\)

\(\displaystyle \theta_2 =\)

\(\displaystyle z(\rho,\theta) =\)

(d) A expressão seguinte permite determinar o volume do tronco de cone \(S_1\).

\(\displaystyle I=\int_{0}^{2}\int_{0}^{2\pi}\int_{2\rho-4}^{0}r\,\mathrm{d}z\mathrm{d}\theta\mathrm{d}\rho\,-\,\int_{0}^{1}\int_{0}^{2\pi}\int_{2\rho-4}^{-2}r\,\mathrm{d}z\mathrm{d}\theta\mathrm{d}\rho\)

True

Your last answer was interpreted as follows: $\mathbf{true}$

Correct answer, well done.

A correct answer is 1, which can be typed in as follows: `1`
A correct answer is $2\cdot \pi$, which can be typed in as follows: `2*%pi`
A correct answer is $2\cdot \rho-4$, which can be typed in as follows: `2*rho-4`
A correct answer is 1, which can be typed in as follows: `1`
A correct answer is 2, which can be typed in as follows: `2`
A correct answer is 4, which can be typed in as follows: `4`
A correct answer is $\frac{\rho^2}{4}$, which can be typed in as follows: `rho^2/4`
A correct answer is 4, which can be typed in as follows: `4`
A correct answer is $\frac{9}{2}$, which can be typed in as follows: `9/2`
A correct answer is 4, which can be typed in as follows: `4`
A correct answer is $\frac{14\cdot \pi}{3}$, which can be typed in as follows: `(14*%pi)/3`
A correct answer is $4\cdot \pi$, which can be typed in as follows: `4*%pi`
A correct answer is $30\cdot \pi$, which can be typed in as follows: `30*%pi`
A correct answer is $\frac{51\cdot \pi}{4}$, which can be typed in as follows: `(51*%pi)/4`
A correct answer is 4, which can be typed in as follows: `4`
A correct answer is $\frac{9}{2}$, which can be typed in as follows: `9/2`
A correct answer is 0, which can be typed in as follows: `0`
A correct answer is $2\cdot \pi$, which can be typed in as follows: `2*%pi`
A correct answer is 4, which can be typed in as follows: `4`
A correct answer is $\mathbf{true}$.

« PREVIOUS ACTIVITY
Submissão de rascunhos e página de consulta permitida no exame da época normal

NEXT ACTIVITY
AM2: dezasseis* Prova Complementar »