

GABARITO OPT. GEOM. ESPACIAL

$$\underline{I.1} \quad V = 11; \quad F_3 = F_4; \quad F_5 = 1. \quad \underline{S.I}$$

Rel. de Euler: $V - F + A = 2$

$$V + F - A = 2$$

$$F = F_3 + F_4 + 1 \quad \text{Como } F_3 = F_4, \text{ rem.}$$

$$V = A - F_3 + 1 \quad \boxed{F = A - F_3 + 1}$$

$$\text{num. de caras: } 2A = 3 \cdot F_3 + 4 \cdot F_4 + 5 \cdot F_5$$

$$2A = 3 \cdot F_3 + 4 \cdot F_3 + 5 \cdot 1$$

$$\Rightarrow A = \frac{7F_3 + 5}{2}$$

$$\Rightarrow V + F - A = 2A - 2A + 2 = 2$$

$$11 + 2F_3 + 2 - \frac{7F_3 + 5}{2} = 2$$

$$22 + 4F_3 + 2 - 7F_3 - 5 = 4$$

$$- 3F_3 = 15 \Rightarrow \boxed{F_3 = 5}$$

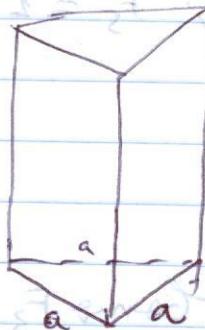
$$\Rightarrow F_4 = F_3 = 5$$

$$\Rightarrow \boxed{F_5 = 2F_3 + 1 = 2 \cdot 5 + 1 = 11}$$

$$\text{num. de faces} =$$

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I.2:



$$h = 5\sqrt{3} \text{ cm}$$

$$\beta = \gamma \Rightarrow \Delta = V$$

$$A_f = A_b + 56\sqrt{3} \text{ cm}^2$$

$$\text{mtr. } \beta = \gamma \Rightarrow A_f = 3a \cdot h = 15\sqrt{3} \cdot a$$

BASE: TRIANGULO EQUILATERO

DE LADO a

$$\frac{a^2\sqrt{3}}{4}$$

$$27 \cdot 2 + 7\beta + 5\gamma = AS \quad ; \text{ catetos } ab, \text{ mtr.}$$

$$\Rightarrow A_f = A_b + 56\sqrt{3} = AS$$

$$\Rightarrow 15\sqrt{3} \cdot a = \frac{a^2\sqrt{3}}{4} + 56\sqrt{3}$$

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$$\Rightarrow a^2 - 60a + 224 = 0 \quad ; \beta + \gamma$$

$$S = 2 + 7f - 1 + 7s + 11$$

$$a = \frac{60 \pm \sqrt{3600 - 896}}{2} = \frac{60 \pm 52}{2}$$

$$\beta = 2 - \frac{1}{2}f + \frac{1}{2}s + \frac{1}{2}s \quad ; \gamma = 7f + 7s + 11$$

$$\Rightarrow a = 56 \text{ cm} \quad \text{ou} \quad a = 4 \text{ cm.}$$

Então:

$$V = A_b \cdot h$$

$$= \frac{a^2\sqrt{3}}{4} \cdot 5\sqrt{3}$$

$$= \frac{4^2 \cdot \sqrt{3} \cdot 5\sqrt{3}}{4}$$

$$= 60 \text{ cm}^3$$

$$2 = \beta = \gamma =$$

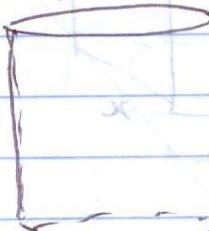
$$\text{ou: } V = A_b \cdot h$$

$$4 + 8 = \frac{a^2\sqrt{3}}{4} \cdot 5\sqrt{3}$$

$$= \frac{(56)^2\sqrt{3} \cdot 5\sqrt{3}}{4}$$

$$= 11760 \text{ cm}^3$$

I - 3



seção meridiana:

$$A_s = (2R)^2 = 4R^2$$

$$A_{\text{ped}} = (1+\epsilon)(1-\epsilon) \cdot \cancel{R} + \cancel{R} = ? \cdot \cancel{R} = A$$

$$V = A b \cdot h = \pi R^2 2R$$

$$A_{\text{ped}} = S_{\text{ss}} + S_{\text{ss}} + S_{\text{ss}} + S_{\text{ss}} + S_{\text{ss}} \Leftrightarrow = 2\pi R^3 = ?$$

$$A_d = A_s + 4\pi$$

$$A_{\text{ped}} = S_{\text{ss}}$$

$$\Rightarrow 2\pi R \cdot (2R) = 4R^2 + 4\pi$$

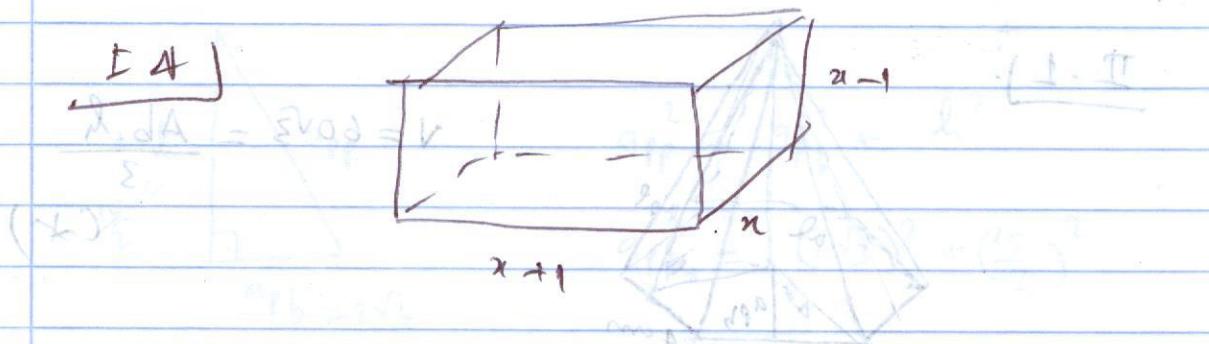
$$4\pi R^2 - 4R^2 = 4\pi$$

$$\Rightarrow R = \sqrt{\frac{4\pi}{4\pi - 4}} = \sqrt{\frac{\pi}{\pi - 1}} \text{ cm.}$$

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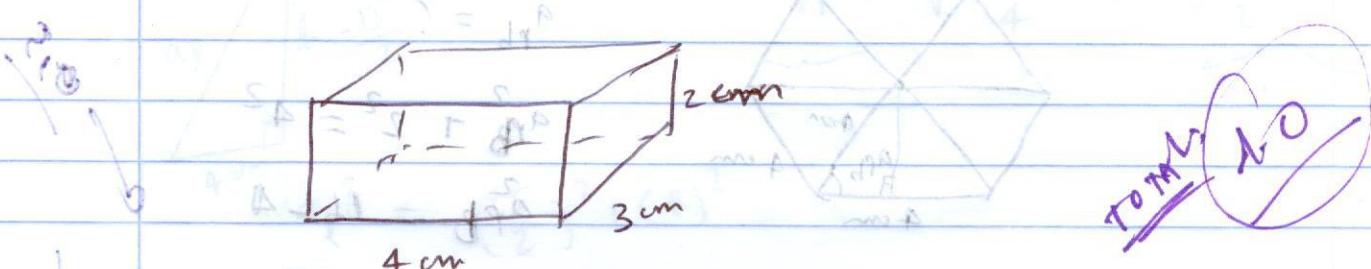
$$\Rightarrow V = 2\pi R^3 = 2\pi \cdot \sqrt{\left(\frac{\pi}{\pi - 1}\right)^3} =$$

$$= 2\pi \cdot \frac{\pi}{\pi - 1} \cdot \sqrt{\frac{\pi}{\pi - 1}} = \frac{2\pi^2}{\pi - 1} \cdot \sqrt{\frac{\pi}{\pi - 1}} \text{ cm}^3$$



$$x+1 + x + x-1 = 9$$

$$3x = 9 \Rightarrow x = 3 \text{ cm}$$

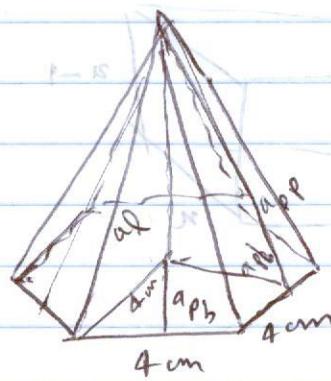


a) $surd = \sqrt{a^2 + b^2 + c^2} = \sqrt{16 + 9 + 4} = \sqrt{29} \text{ cm}$

b) $V = a \cdot b \cdot c = 4 \cdot 3 \cdot 2 = 24 \text{ cm}^3$

$$\frac{m}{5} = \frac{0.8}{4} = \frac{0.8}{8} = \frac{0.8}{16} = \frac{0.8}{32} = \frac{0.8}{64} = \frac{0.8}{128} = \frac{0.8}{256} = \frac{0.8}{512} = \frac{0.8}{1024} = \frac{0.8}{2048} = \frac{0.8}{4096} = \frac{0.8}{8192} = \frac{0.8}{16384} = \frac{0.8}{32768} = \frac{0.8}{65536} = \frac{0.8}{131072} = \frac{0.8}{262144} = \frac{0.8}{524288} = \frac{0.8}{1048576} = \frac{0.8}{2097152} = \frac{0.8}{4194304} = \frac{0.8}{8388608} = \frac{0.8}{16777216} = \frac{0.8}{33554432} = \frac{0.8}{67108864} = \frac{0.8}{134217728} = \frac{0.8}{268435456} = \frac{0.8}{536870912} = \frac{0.8}{1073741824} = \frac{0.8}{2147483648} = \frac{0.8}{4294967296} = \frac{0.8}{8589934592} = \frac{0.8}{17179869184} = \frac{0.8}{34359738368} = \frac{0.8}{68719476736} = \frac{0.8}{137438953472} = \frac{0.8}{274877906944} = \frac{0.8}{549755813888} = \frac{0.8}{1099511627776} = \frac{0.8}{2199023255552} = \frac{0.8}{4398046511104} = \frac{0.8}{8796093022208} = \frac{0.8}{17592186044416} = 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II. L)

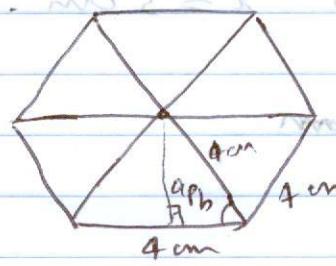


$$V = 60\sqrt{3} = \frac{Ab \cdot h}{3}$$

(*)

$$P = l \cdot s + 6 \cdot \frac{l^2 \sqrt{3}}{4}$$

$$\text{BASE: } m \circ S = P = 6 \cdot \frac{l^2 \sqrt{3}}{4}$$



$$a_{pb} = ?$$

$$a_{pb}^2 + 2^2 = 4^2$$

$$a_{pb}^2 = 16 - 4$$

$$a_{pb}^2 = 12$$

$$a_{pb} = \sqrt{12} = 2\sqrt{3} \text{ cm}$$

$$A_b = b \cdot \frac{l^2 \sqrt{3}}{4} = 6 \cdot \frac{4^2 \sqrt{3}}{4} = 24\sqrt{3} \text{ cm}^2$$

⇒ De (*), nem:

$$S_{\text{min}} + S = S \cdot S \cdot A = V \quad (\text{d})$$

$$\frac{24\sqrt{3} \cdot h}{3} = 60\sqrt{3}$$

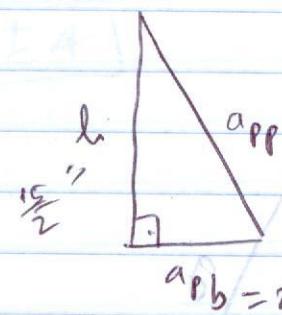
$$8h = 60 \Rightarrow h = \frac{60}{8} = \frac{30}{4} = \frac{15}{2} \text{ cm}$$

$$\Rightarrow h = \frac{15}{2} \text{ cm.}$$

$$Al = ?$$

$$Al = b \cdot \frac{l \cdot a_{pp}}{2} \text{ on}$$

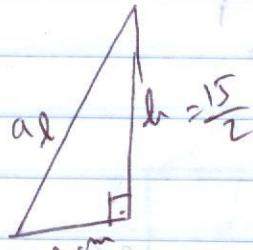
$$Al = P \cdot a_{pp}$$



$$a_{pp}^2 = a_{pb}^2 + h^2$$

$$a_{pp}^2 = (2\sqrt{3})^2 + \left(\frac{15}{2}\right)^2$$

$$a_{pp}^2 = 12 + \frac{225}{4}$$



$$a_{pp} = \sqrt{\frac{273}{4}} = \frac{\sqrt{273}}{2} \text{ cm}$$

$$a_l^2 = \left(\frac{15}{2}\right)^2 + (4)^2 = 12.25 \cancel{+ 16} = \frac{62.5}{4} \cancel{= 15.625}$$

$$a_l = \sqrt{\frac{225}{4} + 16} = \sqrt{\frac{225 + 64}{4}} = \sqrt{\frac{289}{4}}$$

$$a_l = \frac{17}{2} \text{ cm}$$

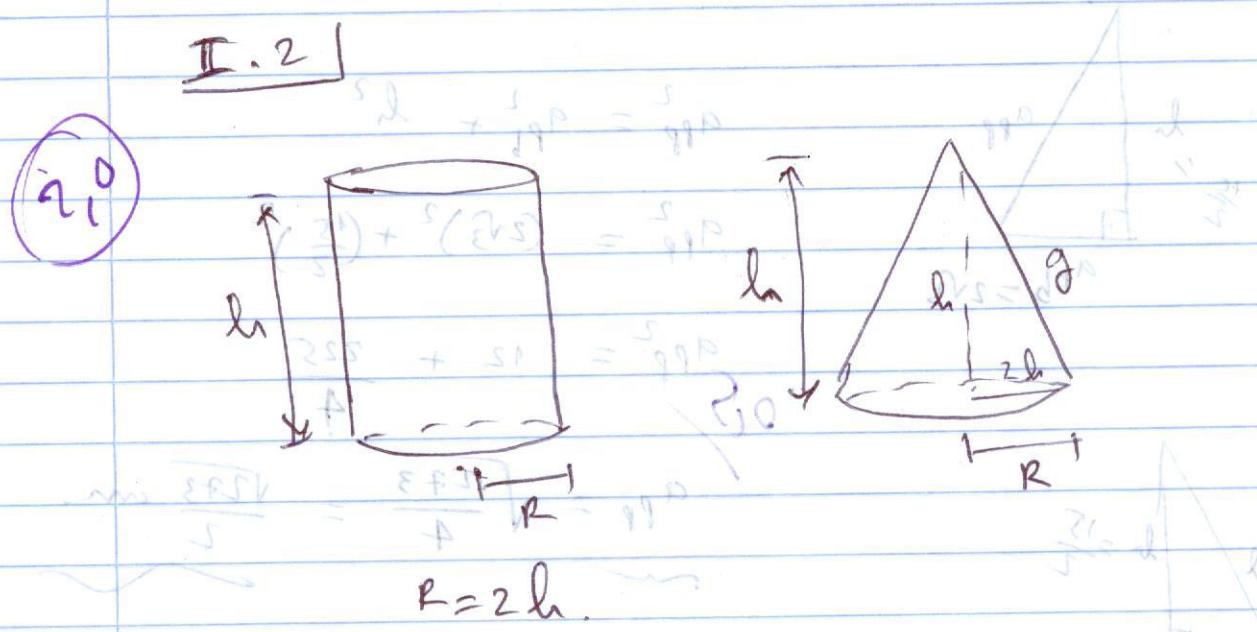
$$\text{Area} = A_l = a_{pb} \cdot a_{pp} = \frac{\pi}{2} \cdot 12 = \frac{\sqrt{273}}{2} \text{ cm}^2$$

$$= \boxed{6\sqrt{273} \text{ cm}^2}$$

total $\cancel{310}$

I.2

(2.0)



a)

$$A_{\text{cil}} = 2\pi R \cdot h = 2\pi \cdot 2h \cdot h = 4\pi h^2$$

$$\frac{P85}{4} A_{\text{cone}} = \pi R g \quad \text{onde: } g = \sqrt{h^2 + (2h)^2}$$

$$g^2 = h^2 + R^2 \Rightarrow g = \sqrt{h^2 + (2h)^2} \\ \Rightarrow g = \sqrt{5h^2} = \sqrt{5} \cdot h.$$

$$\frac{P85}{4} \Rightarrow A_{\text{lcone}} = \pi R g = \pi \cdot 2h \cdot \sqrt{5} \cdot h = 2\pi \sqrt{5} h^2$$

$$\frac{P85}{4} \Rightarrow \frac{A_{\text{cil}}}{A_{\text{cone}}} = \frac{4\pi h^2}{2\pi \sqrt{5} h^2} = \frac{2}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{2\sqrt{5}}{5}$$

1.0

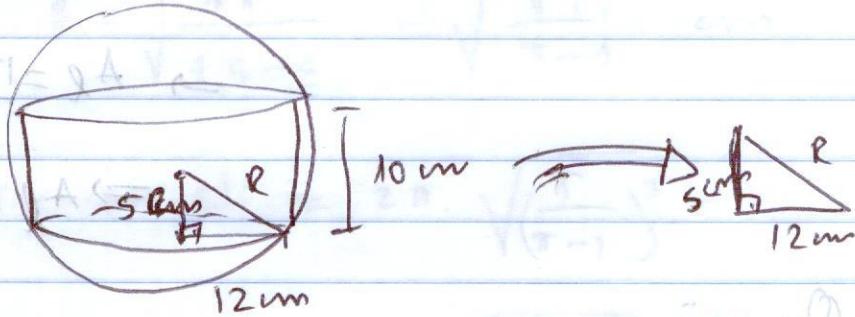
0,4m² 10%

$$b) V_{cyl} = A_b \cdot h = \pi R^2 \cdot h = \pi \cdot (2h)^2 \cdot h \\ = 4\pi h^3$$

$$V_{cone} = \frac{A_b \cdot h}{3} = \frac{\pi R^2 \cdot h}{3} = \frac{\pi \cdot (2h)^2 \cdot h}{3} \\ = \frac{4\pi h^3}{3}$$

$$\Rightarrow \frac{V_{cyl}}{V_{cone}} = \frac{\frac{4\pi h^3}{3}}{\frac{4\pi h^3}{3}} = 3$$

II.3



$$r_{\text{cone}}^2 + h_{\text{cone}}^2 = r_{\text{cylinder}}^2 + h_{\text{cylinder}}^2 \\ r_{\text{cone}}^2 = 5^2 + 12^2 \\ r_{\text{cone}}^2 = 25 + 144 \rightarrow r_{\text{cone}} = \sqrt{169} = 13 \text{ cm}$$

Assim:

$$A = 4\pi R^2 = 4\pi (13)^2 \\ = 676\pi \text{ cm}^2$$

(No)

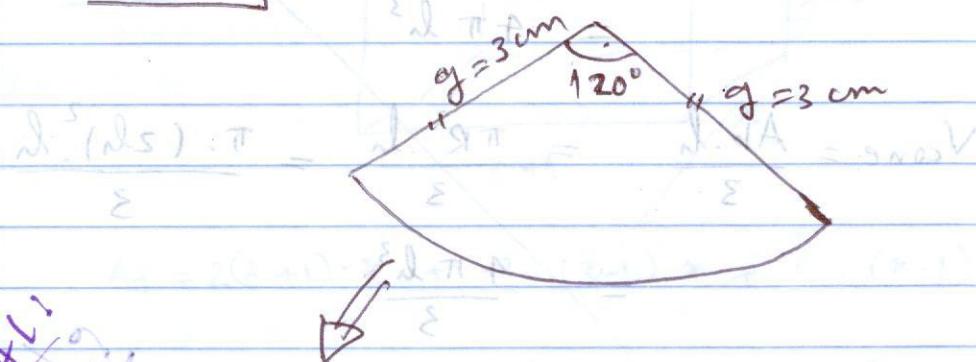
$$\pi \frac{d}{2} + \pi d = \frac{d}{2} + 2d = \frac{5d}{2}$$

$\frac{d}{2}$

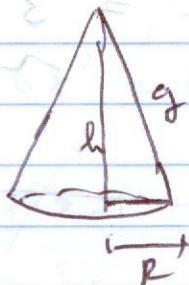
$$S_{\text{base}} = \frac{\pi d^2}{4}$$

Foto Dr. Mauro

II.4



~~Total L.~~
25%



$$\frac{360^\circ}{120^\circ} \cancel{\frac{\pi \cdot g^2}{A_l}} \quad A_l = \frac{12\pi g^2}{36}$$

$$360^\circ \cdot A_l = 120^\circ \cdot \pi g^2$$

$$\Rightarrow A_l = \frac{12\pi g^2}{36}$$

$$\Rightarrow A_l = \frac{4\pi g^2}{9} \quad \text{OK}$$

On reçoit ; $A_l = 4\pi \cdot \underline{(3)^2} = 4\pi \text{ cm}^2$

$$\text{PDT} = g \leftarrow \text{PDT} + 2g = g$$

$$\text{mais } g = A_l = \pi R \cdot g$$

$$\Rightarrow 4\pi = \pi R \cdot 3 \Rightarrow R = \frac{4}{3} \text{ cm}$$

Assim :

$$A_T = A_l + A_b = \pi R g + \pi R^2$$

$$\sim = \pi \cdot \frac{4}{3} \cdot 3 + \pi \cdot \left(\frac{4}{3}\right)^2 = 4\pi + \frac{16}{9}\pi$$

$$= \frac{52\pi}{9} \text{ cm}^2$$

OK

Fundação Universidade Federal de Pelotas
Departamento de Matemática e Estatística
Curso de Licenciatura em Matemática
Prova Optativa de Geometria Espacial
Prof. Dr. Maurício Zahn

Nome:

Data: 01/03/2018

Instruções. Escolha 2 questões da **PARTE I** e 3 questões da **PARTE II** para resolver, assinalando com um “x” no espaço []. A nota da prova é definida por:

$$\text{Nota} = \frac{\text{soma de acertos} \times 10,0}{\text{soma de pontos escolhidos}}$$

Esta Prova pode substituir a nota mais baixa (e somente uma) entre as duas provas semestrais.

PARTE I

[] **Questão I.1.** (2,0 pt) Um poliedro convexo tem 11 vértices, o número de faces triangulares igual ao número de faces quadrangulares e uma face pentagonal. Calcule o número de faces desse poliedro.

[] **Questão I.2.** (2,0 pt) Calcule o volume de um prisma triangular regular de $5\sqrt{3}$ cm de altura, sabendo que a área lateral excede a área da base em $56\sqrt{3}$ cm².

[] **Questão I.3.** (2,0 pt) Sabendo que a área lateral excede em $4\pi \text{ cm}^2$ a área da seção meridiana de um cilindro equilátero, determine a medida do seu raio e o volume do cilindro.

[] **Questão I.4.** (1,0 pt) As dimensões de um paralelepípedo retângulo estão em progressão aritmética. Sabendo que a soma das medidas das três arestas mede 9 cm, determine:

- (a) a medida da diagonal desse paralelepípedo;
 - (b) o volume do paralelepípedo.

PARTE II

[] **Questão II.1.** (3,0 pt) O volume de uma pirâmide regular hexagonal é $60\sqrt{3}$ cm³, sendo 4 cm o lado do hexágono. Calcule as medidas da altura, aresta lateral e o apótema da pirâmide. Determine também a medida da área lateral dessa pirâmide.

[] **Questão II.2.** (2,0 pt) Um cilindro e um cone têm altura h e raio da base R . Sendo $R = 2h$, determine a razão entre:

- (a) a área lateral do cilindro e a área lateral do cone;
 (b) o volume do cilindro e o volume do cone.

[] **Questão II.3.** (1,0 pt) Um cilindro de revolução de altura 10 cm e raio da base 12 cm está inscrito em uma esfera. Calcule a área da superfície esférica e o volume da esfera.

[] **Questão II.4.** (2,5 pt) Com um setor circular de 120° e raio 3 cm construímos um cone. Calcule a área total e o volume desse cone.

[] **Questão II.5.** (1,0 pt) A área de uma seção plana de uma esfera é $144\pi \text{ cm}^2$. Determine o volume dessa esfera, sabendo que esta seção equidista 5 cm do centro da esfera.