

ÁLGEBRA MATRICIAL Y GEOMETRÍA ANALÍTICA
EXAMEN FINAL
SEMESTRE ACADÉMICO 2024-1

Duración: 180 minutos

TURNO 2

HORARIOS: A101, B101, B102, B103, I101, I102, I103, 104, I105, 117, 118, 119, 120 Y 121

ADVERTENCIAS:

- Todo dispositivo electrónico (teléfono, tableta, computadora u otro) deberá permanecer apagado durante la evaluación.
- Coloque todo aquello que no sean útiles de uso autorizado durante la evaluación en la parte delantera del aula, por ejemplo, mochila, maletín, cartera o similar, y procure que contenga todas sus propiedades.
- Si se detecta omisión a los dos puntos anteriores, la evaluación será considerada nula y podrá conllevar el inicio de un procedimiento disciplinario en determinados casos.
- Tome las precauciones necesarias para no requerir la utilización de servicios higiénicos: durante la evaluación, no podrá acceder a ellos; de tener alguna emergencia, comuníquese a su jefe de práctica.
- Para retirarse del aula y dar por concluida su evaluación, deberá haber transcurrido al menos la primera mitad del tiempo de duración destinado a ella.

INDICACIONES:

- Puede usar una calculadora que no sea programable y que no grafique.
- No puede usar apuntes de clase ni libros.
- El examen consta de 5 preguntas. Debe justificar sus respuestas.
- Puede responder las preguntas en el orden que desee, sólo indique el número de la pregunta que está resolviendo al inicio de la misma.

Pregunta 1

Consideré las ecuaciones de los planos:

$$\Pi_1: x + \beta y + 2z = \beta + 2$$

$$\Pi_2: x + \beta^2 y + 2z = \beta + 2$$

$$\Pi_3: 3x + 3\beta y + (\beta^2 + 5)z = \beta^2 + 3\beta + 5$$

$$\Pi_4: \beta x + \beta^2 y + (\beta^2 + 1)z = 2\beta^2 + 1$$

- a) Indique qué operaciones deben hacerse con dichas ecuaciones para transformar el sistema en otro, representado por la siguiente matriz.

$$\left[\begin{array}{ccc|c} 1 & \beta & 2 & \beta + 2 \\ 0 & \beta^2 - \beta & 0 & 0 \\ 0 & 0 & \beta^2 - 1 & \beta^2 - 1 \\ 0 & 0 & \beta - 1 & \beta - 1 \end{array} \right]$$

(1 punto)

- b) Analice para qué valores de β ,

- el sistema tiene como conjunto solución un plano y halle la ecuación de dicho plano.
- el sistema tiene como conjunto solución un punto y halle sus coordenadas.
- el sistema tiene como conjunto solución una recta y halle su ecuación.
- el sistema no tiene solución.

(4 puntos)

Pregunta 2

- a) Simplifique la siguiente expresión y dé la respuesta en forma binómica $a + bi$, donde a y $b \in \mathbb{R}$.

$$E = \frac{(1 - \sqrt{3}i)^9(-3 + 3i)^{14}}{\left(-2 \cos\left(\frac{2\pi}{3}\right) + 2\sin\left(\frac{2\pi}{3}\right)i\right)^{24}(1+i)^{20}}$$

(3 puntos)

- a) Halle el número complejo $z \neq -1$, si se sabe que su conjugado, \bar{z} , satisface la siguiente ecuación:

$$\frac{-4i}{\bar{z} + 1} + \frac{(2-i)^2 - 3}{2} = 1 + i^4$$

(2 puntos)

Pregunta 3

Considera la matriz $A = \begin{pmatrix} 3 & 2 & -1 \\ 4 & -1 & 0 \\ 5 & -1 & 1 \end{pmatrix}$ y la identidad I de orden 3.

- a) Halle la matriz de cofactores $Cof(A - 7I)$. (1 punto)

- b) Dada la matriz $B = \begin{pmatrix} -1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$, halle la matriz X que satisface la siguiente ecuación

$$(XA^t)^t = 7X^t + B.$$

(2 puntos)

Pregunta 4

Al intersecar la esfera S con el plano $\Pi_1: z = 0$, se obtiene la circunferencia C cuyo radio mide 4 unidades y cuyo centro se encuentra en la recta $L: P = (6; 3; 2) + t(1; 2; 1), t \in \mathbb{R}$. Se sabe además que el plano $\Pi_2: 4y + 3z - 12 = 0$ es tangente a la esfera S en el punto $T(4; 3; 0)$.

Halle el centro de la circunferencia C y la ecuación de la esfera S .

(4 puntos)

Pregunta 5

Analice si las siguientes afirmaciones son verdaderas o falsas.

- a) Si A y B son matrices no nulas de orden n , entonces $(A + B)^2 = A^2 + 2AB + B^2$. (1,5 puntos)
- b) Sean A y B matrices invertibles de orden 2. Si $BA^2 = 5A^{-1}B^{-1}$ y $\det(B) = -5$ entonces $\det(A) = -1$. (1,5 puntos)

Año

Número

2 0 2 4

2 3 4 1

Código de alumno

Segundo examen

Ruiz Rodríguez, Miguel Fabrizio

Apellidos y nombres del alumno (letra de imprenta)

Miguel Ruiz

Firma del alumno

Curso: AMGA

Horario: H1B

Fecha: 01/07/24

Nombre del profesor: Omar Cárdenes

Nota

19


Firma del profesor

INDICACIONES

1. Llene todos los datos que se solicitan en la carátula, tanto los personales como los del curso.
2. Utilice las zonas señaladas del cuadernillo para presentar su trabajo en limpio. Queda terminantemente prohibido el uso de hojas sueltas.
3. Presente su trabajo final con la mayor claridad posible. No desglose ninguna hoja de este cuadernillo. Indique de una manera adecuada si desea que no se tome en cuenta alguna parte de su desarrollo.
4. Presente su trabajo final con la mayor pulcritud posible. Esto incluye lo siguiente:
 - cuidar el orden, la redacción, la claridad de expresión, la corrección gramatical, la ortografía y la puntuación en su desarrollo;
 - escribir con letra legible, dejando márgenes y espacios que permitan una lectura fácil;
 - evitar borrones, manchas o roturas;
 - no usar corrector líquido;
 - realizar los dibujos, gráficos o cuadros requeridos con la mayor exactitud y definición posibles.
5. No seguir estas indicaciones influirá negativamente en su calificación.
6. Al recibir este examen calificado, tome nota de las sugerencias que se le dan en la contracarátula del cuadernillo.

$$A = \begin{pmatrix} 1 & B & 2 & 1 & B+2 \\ 1 & B^2 & 2 & B+2 & B+2 \\ 1 & B & B^2 & B^2 + 5 & B^2 + 3B + 5 \\ 3 & 3B & B^2 + 5 & 2B^2 + 1 & 2B^2 + 1 \\ B & B^2 & B^2 + 1 & 1 & 1 \end{pmatrix}$$

$$\begin{array}{l} f_2 - f_1 = f_2 \\ \hline -3f_1 + f_3 = f_3 \\ \hline \text{sees } \end{array} \left(\begin{array}{cc|c} 1 & B & 2 & B+2 \\ 0 & B^2-B & 0 & 0 \\ 0 & B^2-B & 1 & B^2-1 \\ B & B^2 & B^2+1 & 2B^2+1 \end{array} \right)$$

$$-\beta H_1 + f_4 = f_4 \quad \left(\begin{array}{ccccc} 1 & B & 2 & 1 & B+2 \\ 0 & B^2 - B & 0 & 0 & 0 \\ 0 & 0 & B^2 - 1 & 1 & B^2 - 1 \\ 0 & 0 & B^2 - 2B + 1 & 1 & B^2 - 2B + 1 \end{array} \right)$$

$$-1 \cancel{f_3 + f_4 = f_4} \left(\begin{array}{cccc|c} 1 & B & 2 & B+2 \\ 0 & B^2 - B & 0 & 0 \\ 0 & 0 & B^2 - 1 & B^2 - 1 \\ 0 & 0 & -2(B-1) & -2(B-1) \end{array} \right)$$

$$\text{Handwritten note: } \frac{f'''}{2} = f'''$$

$$\left(\begin{array}{ccccc} 1 & B & 2 & | & B+2 \\ 0 & B^2 - B & 0 & | & 0 \\ 0 & 0 & B^2 - 1 & | & B^2 - 1 \\ 0 & 0 & B - 1 & | & B - 1 \end{array} \right)$$

$$S: B = 1$$
~~$$T4: 0 = 0 \quad \text{tautolog.}$$~~

$$\pi_3 := (B^2 - 1)Z - (B^2 - 1) \text{ (autotol, 6)}$$

$$(B+1)(B-1)/2 = (B+1)(B-1)$$

~~-----~~

$$(B^2 - B)y = 0$$

$$f_0(B-1) \cdot y = 0$$

o y -

~~0=0 Tautologica~~

$$x + 1 - y + 2z = 3$$

~~$x+2z=3$~~ ; un plan

$$\text{Si } B = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \text{ la ecuación es } x + y = 2 \text{ en el plano}$$

A horizontal row of stylized, abstract shapes drawn with blue ink on graph paper. The shapes include various loops, curves, and small circles, some connected by thin lines.

~~2~~ ~~3-1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ ~~7~~ ~~8~~ ~~9~~ ~~10~~ ~~11~~ ~~12~~ ~~13~~ ~~14~~ ~~15~~ ~~16~~ ~~17~~ ~~18~~ ~~19~~ ~~20~~ ~~21~~ ~~22~~ ~~23~~ ~~24~~ ~~25~~ ~~26~~ ~~27~~ ~~28~~ ~~29~~ ~~30~~ ~~31~~ ~~32~~ ~~33~~ ~~34~~ ~~35~~ ~~36~~ ~~37~~ ~~38~~ ~~39~~ ~~40~~ ~~41~~ ~~42~~ ~~43~~ ~~44~~ ~~45~~ ~~46~~ ~~47~~ ~~48~~ ~~49~~ ~~50~~ ~~51~~ ~~52~~ ~~53~~ ~~54~~ ~~55~~ ~~56~~ ~~57~~ ~~58~~ ~~59~~ ~~60~~ ~~61~~ ~~62~~ ~~63~~ ~~64~~ ~~65~~ ~~66~~ ~~67~~ ~~68~~ ~~69~~ ~~70~~ ~~71~~ ~~72~~ ~~73~~ ~~74~~ ~~75~~ ~~76~~ ~~77~~ ~~78~~ ~~79~~ ~~80~~ ~~81~~ ~~82~~ ~~83~~ ~~84~~ ~~85~~ ~~86~~ ~~87~~ ~~88~~ ~~89~~ ~~90~~ ~~91~~ ~~92~~ ~~93~~ ~~94~~ ~~95~~ ~~96~~ ~~97~~ ~~98~~ ~~99~~ ~~100~~ ~~101~~ ~~102~~ ~~103~~ ~~104~~ ~~105~~ ~~106~~ ~~107~~ ~~108~~ ~~109~~ ~~110~~ ~~111~~ ~~112~~ ~~113~~ ~~114~~ ~~115~~ ~~116~~ ~~117~~ ~~118~~ ~~119~~ ~~120~~ ~~121~~ ~~122~~ ~~123~~ ~~124~~ ~~125~~ ~~126~~ ~~127~~ ~~128~~ ~~129~~ ~~130~~ ~~131~~ ~~132~~ ~~133~~ ~~134~~ ~~135~~ ~~136~~ ~~137~~ 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y

$$\theta = -$$

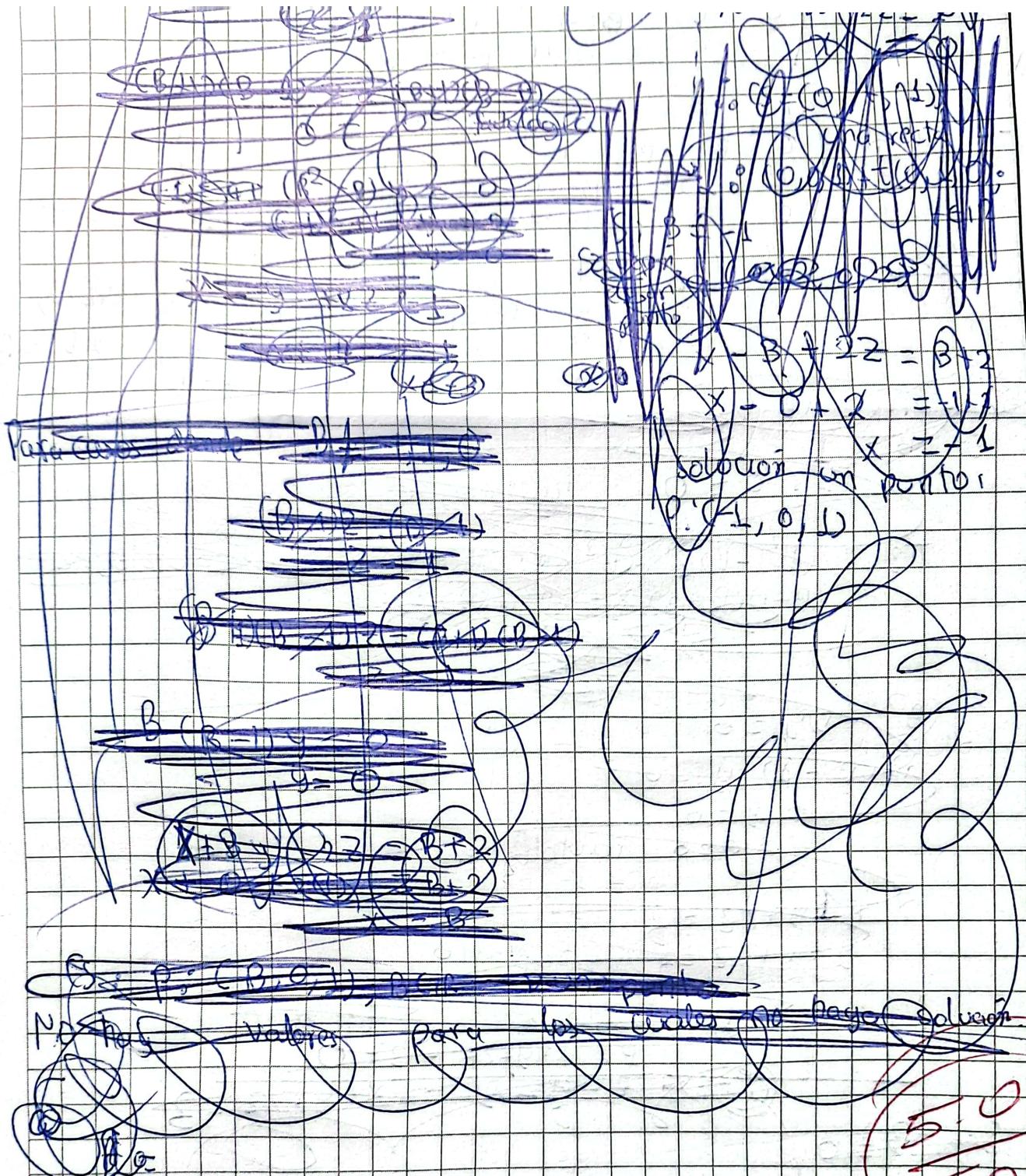
$$2 - 1$$

$$\lambda_2 = -$$

$$z =$$

$$(1)^2 - 1 \cdot 1$$

TOTAL



2)

2(a) Reescribimos $m = (1 - \sqrt{3}i)$ =



$$0 + B \approx 2\pi \quad |m| = \sqrt{1^2 + (\sqrt{3})^2} = 2$$

$$B = \arctan \sqrt{3} = \frac{\pi}{3}$$

$$\Theta = 2\pi - \frac{\pi}{3} = \frac{5\pi}{3}$$

Guía para cálculos y desarrollos
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$$\begin{array}{c} 14 \\ 12 \\ 10 \\ 8 \\ 6 \\ 4 \\ 2 \\ 1 \end{array}$$

$$\begin{array}{c} 8\pi + 0 \\ 14\pi + 1\pi \\ 10\pi + 2\pi \\ 6\pi + 3\pi \\ 4\pi + 4\pi \\ 2\pi + 5\pi \\ 1\pi + 6\pi \end{array}$$

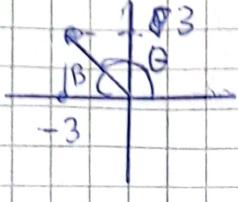
$$\begin{array}{r} 2^9 3^{14} 2^7 \\ \hline 2^{24} 2^2 10 \\ 2^{16} 3^{14} \\ \hline 2^{34} \end{array}$$

$m = 2 (\cos(5\pi) + i \operatorname{sen}(5\pi))$ ✓ 0.5P

$m^9 = 2^9 (\cos(15\pi) + i \operatorname{sen}(15\pi))$

$m^9 = 2^9 (\cos(14\pi + \pi) + i \operatorname{sen}(14\pi + \pi)) = 2^9 (\cos\pi + i \operatorname{sen}\pi)$ ✓

$n = -3 + \sqrt{3}i$ $n = -3 + 3i$



$\theta + \pi = \pi$ $|n| = 3\sqrt{2}$

$\theta = \arctan\left(\frac{\sqrt{3}}{3}\right) = \frac{\pi}{4}$

$\theta = \pi - \frac{\pi}{4} = 3\frac{\pi}{4}$

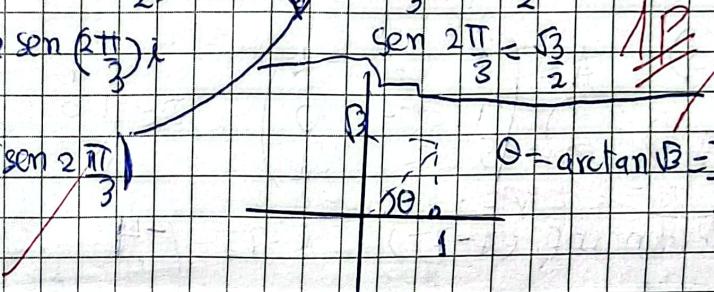
$n = 3\sqrt{2} \left(\cos\left(3\frac{\pi}{4}\right) + i \operatorname{sen}\left(3\frac{\pi}{4}\right) \right)$

$n = 3\sqrt{2} \left(\cos\left(21\pi\right) + i \operatorname{sen}\left(21\pi\right) \right) = 3\sqrt{2} \left(\left(\cos\left(10\pi + \frac{\pi}{2}\right) + i \operatorname{sen}\left(10\pi + \frac{\pi}{2}\right)\right)$

$n^{14} = 3^{14} \left(\cos\left(\frac{\pi}{2}\right) + i \operatorname{sen}\left(\frac{\pi}{2}\right) \right)$ ✓ 0.5P

$\omega = \frac{2\pi}{3} = -i$

$P = -2 \cos\left(2\frac{\pi}{3}\right) + 2 \operatorname{sen}\left(2\frac{\pi}{3}\right)i$



$P = +2 \left(-\cos\left(2\frac{\pi}{3}\right) + i \operatorname{sen}\left(2\frac{\pi}{3}\right) \right)$

$P = 1 + \sqrt{3}i$

$|\omega| = \sqrt{2} \quad \theta = \arctan\sqrt{3} = \frac{\pi}{3}$

$P = 2 \left(\cos\left(\frac{\pi}{3}\right) + i \operatorname{sen}\left(\frac{\pi}{3}\right) \right)$

$P^{24} = 2^{24} \left(\cos(8\pi) + i \operatorname{sen}(8\pi) \right) = 2^{24} \left(\cos 0 + i \operatorname{sen} 0 \right)$

~~$Q = 1 + i$~~ ~~$Q = \sqrt{2} \left(\cos\left(\frac{\pi}{4}\right) + i \operatorname{sen}\left(\frac{\pi}{4}\right) \right)$~~

$Q = \sqrt{2} \left(\cos\left(\frac{\pi}{4}\right) + i \operatorname{sen}\left(\frac{\pi}{4}\right) \right)$

$Q^{20} = 2^{10} \left(\cos(5\pi) + i \operatorname{sen}(5\pi) \right)$

$Q^{20} = 2^{10} \left(\cos(4\pi + \pi) + i \operatorname{sen}(4\pi + \pi) \right)$

$Q^{20} = 2^{10} \left(\cos\pi + i \operatorname{sen}\pi \right)$ ✓ 0.5P

Reemplazando todo en E

$E = m n^{14} = 2^9 \left(\cos\pi + i \operatorname{sen}\pi \right) \cdot 3^{14} \left(\cos\left(\frac{\pi}{2}\right) + i \operatorname{sen}\left(\frac{\pi}{2}\right) \right)$

$E = 2^{24} \left(\cos 0 + i \operatorname{sen} 0 \right) \cdot 2^{10} \left(\cos\left(\frac{\pi}{2}\right) + i \operatorname{sen}\left(\frac{\pi}{2}\right) \right)$

$E = 2^{-18} 3^{14} \left(\cos\left(\frac{\pi}{2}\right) + i \operatorname{sen}\left(\frac{\pi}{2}\right) \right)$

$E = 2^{-18} 3^{14} \left(\cos\frac{\pi}{2} + i \operatorname{sen}\frac{\pi}{2} \right) = 2^{-18} 3^{14} i + 0$

$\operatorname{sen}\frac{\pi}{2} = 1$

$\cos\frac{\pi}{2} = 0$

Presente aquí su trabajo

$$\textcircled{Q} \textcircled{b) } \frac{-4i}{z+1} + \frac{(2-i)^2 - 3}{2} = 1+i^4$$

$$\frac{-4i}{z+1} + \frac{-4i}{2} = 2$$

$$\frac{-4i}{z+1} - 2i = 2$$

$$\frac{-4i}{(z+1)} = 2+2i$$

$$\frac{-4i}{2+2i} = \bar{z}+1$$

$$\frac{-1-i}{2-i} = \bar{z}+1$$

$$\frac{-1-i}{2-i} = \bar{z}$$

$$\therefore z = -2+i$$

Zona exclusiva para cálculos y desarrollos
(borrador) -3

$$\begin{aligned} 1-i &= 2+i \\ 1-i &= \bar{z} \\ -2-i &= z \\ -2+i &= \bar{z} \end{aligned}$$

3) $A = \begin{pmatrix} 3 & 2 & -1 \\ 4 & -1 & 0 \\ 5 & -1 & 2 \end{pmatrix} \quad I = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \quad A - 7I = \begin{pmatrix} -7 & 0 & 0 \\ 0 & -7 & 0 \\ 0 & 0 & -7 \end{pmatrix}$

~~3.9/3.0 TOTAL.~~ $\textcircled{3a) } \text{ Piden cof } (A - 7I) \quad A - 7I = \begin{pmatrix} -4 & 2 & -1 \\ 4 & -8 & 0 \\ 5 & -1 & -6 \end{pmatrix} \quad \text{0.85P}$

$$(A - 7I) = \begin{pmatrix} M_{11} & M_{12} & M_{13} \\ M_{21} & M_{22} & M_{23} \\ M_{31} & M_{32} & M_{33} \end{pmatrix} \quad (A - 7I) = \begin{pmatrix} M_{11} & M_{12} & M_{13} \\ M_{21} & M_{22} & M_{23} \\ M_{31} & M_{32} & M_{33} \end{pmatrix}$$

$$M_{11} = (-1)^{1+1} \begin{vmatrix} 4 & 0 \\ 5 & -6 \end{vmatrix} = 4 \cdot (-6) - 0 \cdot 5 = -24 \quad M_{12} = (-1)^{1+2} \begin{vmatrix} 4 & 0 \\ 5 & -6 \end{vmatrix} = 4 \cdot (-6) - 0 \cdot 5 = 24 \quad M_{13} = (-1)^{1+3} \begin{vmatrix} 4 & 0 \\ 5 & -6 \end{vmatrix} = 4 \cdot (-6) - 0 \cdot 5 = 36$$

$$M_{21} = (-1)^{2+1} \begin{vmatrix} 4 & -1 \\ 5 & -6 \end{vmatrix} = 4 \cdot (-6) - (-1) \cdot 5 = -24 + 5 = -19 \quad M_{22} = (-1)^{2+2} \begin{vmatrix} -4 & 2 \\ 5 & -6 \end{vmatrix} = -4 \cdot (-6) - 2 \cdot 5 = 24 - 10 = 14 \quad M_{23} = (-1)^{2+3} \begin{vmatrix} -4 & 2 \\ 5 & -6 \end{vmatrix} = -4 \cdot (-6) - 2 \cdot 5 = 24 - 10 = 14$$

$$M_{31} = (-1)^{3+1} \begin{vmatrix} 2 & -1 \\ -8 & 0 \end{vmatrix} = -8 \quad M_{32} = (-1)^{3+2} \begin{vmatrix} -4 & -1 \\ 4 & 0 \end{vmatrix} = -4 \quad M_{33} = (-1)^{3+3} \begin{vmatrix} -4 & 2 \\ 4 & -8 \end{vmatrix} = 24$$

$$\text{Cof } (A - 7I) = \begin{pmatrix} 48 & 24 & 36 \\ 13 & 29 & 6 \\ -8 & -4 & 24 \end{pmatrix} \quad \text{0.75P}$$

$$\begin{aligned} 2^4 \times 5 &= 29 \\ 2^4 - 10 &= -6 \\ 4 - 7 &= -3 \\ 8 & \end{aligned}$$

$$32 - 8 = 24$$

$$-12 - 1 = -13$$

$$2^4 + 5 = 29$$

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Bb)

$$(Y A)^t = 7x^t + B$$

~~$$(A - 7I)x^t = B$$~~

$$Ax^t = 7x^t + B$$

$$Ax^t - 7x^t = B$$

$$(A - 7I)x^t = B$$

$$x^t = (A - 7I)^{-1} B$$

$$x^t = (A - 7I)^{-1} B \quad \checkmark \quad 0.5P$$

Hallando $(A - 7I)^{-1} = \frac{1}{|A - 7I|} \text{Adj}(A - 7I)$; $|A - 7I| \neq 0$

$$|A - 7I| = \begin{vmatrix} -4 & 2 & -1 \\ 4 & -8 & 0 \\ 5 & -1 & -6 \end{vmatrix} = -4 \begin{vmatrix} -8 & 0 \\ -1 & -6 \end{vmatrix} - 2 \begin{vmatrix} 4 & 0 \\ 5 & -6 \end{vmatrix} - 1 \begin{vmatrix} 4 & -8 \\ 5 & -1 \end{vmatrix} = -180$$

(~~A - 7I~~)

$$\text{Adj}(A - 7I) = \text{Cof}(A - 7I)^t = \begin{pmatrix} 48 & 13 & -8 \\ 24 & 29 & -4 \\ 36 & 6 & 24 \end{pmatrix}$$

$$(A - 7I)^{-1} = -\frac{1}{180} \begin{pmatrix} 48 & 13 & -8 \\ 24 & 29 & -4 \\ 36 & 6 & 24 \end{pmatrix}$$

$$x^t = -\frac{1}{180} \begin{pmatrix} 48 & 13 & -8 \\ 24 & 29 & -4 \\ 36 & 6 & 24 \end{pmatrix} \cdot \begin{pmatrix} -1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

$$x^t = -\frac{1}{180} \begin{pmatrix} -35 & 13 & -8 \\ 5 & 29 & -4 \\ -30 & 6 & 24 \end{pmatrix} \quad \checkmark \quad 1P$$

$$x^t = -\frac{1}{180} \begin{pmatrix} -35 & 5 & -30 \\ 13 & 29 & 6 \\ -8 & -4 & 24 \end{pmatrix} \quad \checkmark \quad 0.5P$$

Profes, la 4 está después de la 5 y SB

5.0) Falso

Centro ejemplo

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$$

$$B = \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix}$$

$$A + B = \begin{pmatrix} 6 & 8 \\ 10 & 12 \end{pmatrix}$$

$$(A + B)^2 = \begin{pmatrix} 6 & 8 \\ 10 & 12 \end{pmatrix} \begin{pmatrix} 6 & 8 \\ 10 & 12 \end{pmatrix} = \begin{pmatrix} 116 & 144 \\ 180 & 224 \end{pmatrix}$$

$$A^2 = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} = \begin{pmatrix} 7 & 10 \\ 15 & 22 \end{pmatrix} \quad | 2AB = 2 \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix}$$

$$B^2 = \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix} \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix} = \begin{pmatrix} 67 & 78 \\ 91 & 106 \end{pmatrix} ; \quad 2AB = \begin{pmatrix} 36 & 44 \\ 86 & 107 \end{pmatrix}$$

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$$A^2 + 2AB + B^2 = \begin{pmatrix} 110 & 132 \\ 142 & 228 \end{pmatrix}$$

✓ 5

$$\therefore (A+B)^2 = A^2 + 2AB + B^2$$

$$\begin{pmatrix} 116 & 144 \\ 180 & 224 \end{pmatrix} = \begin{pmatrix} 110 & 132 \\ 142 & 228 \end{pmatrix}; \text{ lo cual es absurdo}$$

fs falso

5b)

$$|BA^2| = |5A^{-1}B^{-1}| ; |B| = -5$$

$$|B||A^2| = 5^2 |A^{-1}| |B^{-1}|$$

$$|B||A^2| = 5^2 \frac{1}{|A|} \cdot \frac{1}{|B|}$$

$$-5|A^3| = -5 \frac{1}{|A|}$$

$$|A^3| = 1 \times$$

$$|A| = -1$$

Única Solución real $\Leftrightarrow |A| = 1$

La proposición es verdadera.

Corrección s:

$$-5|A^2| = 5^2 \frac{1}{|A|} \cdot \frac{1}{|A|}$$

$$5|A|^2 = 5^2 \frac{1}{|A|^2}$$

$$|A|^3 = 1$$

$$|A| = 1$$

La proposición es falsa.

4)

$$T_2: 4x + 3y - 2 = 0$$

$$\downarrow$$

$$\vec{n} = (6, 4, 3)$$

$$\lambda: P = (6, 3, 2) + t(1, 2, 1); t \in \mathbb{R}$$

$$r_{circ} = 4$$

$$T: (4, 3, 0)$$

Primeramente, el centro de la circunferencia $\odot C$ es un punto que intersecta a λ y $\alpha \cap \pi_1$

$$\lambda \cap \pi_1 = \odot C$$

$$C_1 = (6+t, 3+2t, 2+t); t \in \mathbb{R}$$

$$\rho: 2+t=0 \\ t=-2$$

$$C_1 = (4, -1, 0)$$

λ_2 pasa por el punto de tangencia y el centro de la circ. $P_0 = P_0 + \vec{v} r$; $r \in \mathbb{R}$; P_0 será el punto de tangencia

$$P_0 = T = (4, 3, 0)$$

Será una recta paralela al vector normal del

$$\text{Plano } \pi_1 = \{P_1, 4, 3\}$$

(4, 3, 0)

② (4, 7, 3)

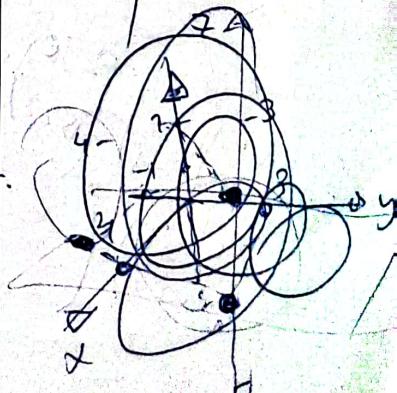
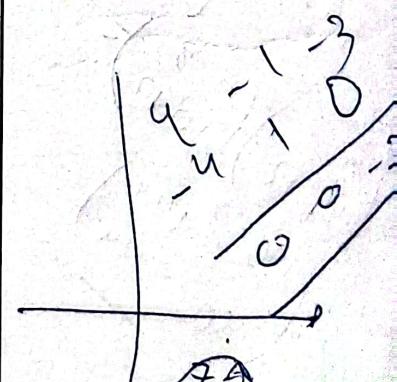
③ (4, -1, 0)

→

(4, 3+4, 3)

(4, 7, 3)

D $(4, 7, 3) \not\in DCC_1T_1$



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$$\begin{aligned} & \text{Diagrama de los círculos:} \\ & C_1: (4, -1, 0) \quad r = 3 \\ & C_2: (0, 4, 3) \quad r = 5 \\ & \text{Distancia entre centros: } D(C_1, C_2) = \sqrt{(4-0)^2 + (-1-4)^2 + (0-3)^2} = \sqrt{16+25+9} = \sqrt{40} = 2\sqrt{10} \\ & \text{Relación entre radios y distancia entre centros: } 3+5 = 8 < 2\sqrt{10} \end{aligned}$$

$$\begin{aligned} & \text{Círculo } C: (x-4)^2 + (y+1)^2 + (z-3)^2 = 25 \\ & \text{Centro: } C = (4, -1, 3) \end{aligned}$$

$$\begin{aligned} & \text{Círculo } C: (x-4)^2 + (y+1)^2 + (z-3)^2 = 25 \\ & \text{Centro: } C = (4, -1, 3) \end{aligned}$$

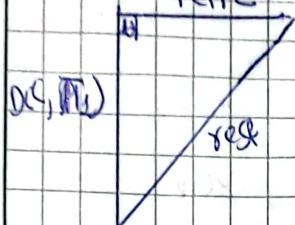
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$\therefore C_2 = (4, 3, 0) + r(0, 4, 3); r \in \mathbb{R}$
El centro pertenece a esa recta.

$$C = (4; 3+4r, 3r); r \in \mathbb{R}$$

Además sabemos que:

$$r \in \mathbb{R}$$



Por propiedad

$$r_C r_C = 16$$

$$r_C^2 = D(C, \Pi_2)$$

Son tangentes

$$D(C, \Pi_2)^2 = r_C^2 + D(C, \Pi_1)^2$$

$$\left(\frac{|4(3+4r)+3(3r)-12|}{\sqrt{3^2+4^2}} \right)^2 = 16 + \left(\frac{|3r|}{\sqrt{1^2}} \right)^2$$

$$\left(\frac{25r}{5} \right)^2 = 16 + (3r)^2$$

$$25r^2 = 16 + 9r^2$$

$$16r^2 - 16 = 0 \quad r^2 = 1$$

$$\sqrt{r^2} = \sqrt{1} \quad r = 1 \quad r = -1$$

Para saber qué valor tomar: $C_1 = (4, -1, 0)$

$$\text{Si } r = 1 \quad C = (4, 7, 3) \quad r = -1 \quad T = (4, 3, 0)$$

$$D(C, \Pi_2) = 5 = r_{\text{rest}}$$

$$D(C, \Pi_1) = 5 = r$$

$$D(C, \Pi_1) = 3$$

$$T = (4, 3, 0)$$

$$|\vec{T}| = \sqrt{(-4)^2 + (3)^2} = \sqrt{16+9} = 5$$

$$D(C, \Pi_2) = 3 \rightarrow |(-3)| = 3$$

$$\vec{T} = (0, 4, 3)$$

$$|\vec{T}| = \sqrt{4^2 + 3^2} = 5$$

$$\vec{C} = (0, 8, 3)$$

$$|\vec{C}| = (0, 0, -3)$$

$$|\vec{C}| = \sqrt{73} = \sqrt{(8)^2 + (3)^2}$$

$$\frac{|4(7)+3(3)-12|}{\sqrt{3^2+4^2}} = 5$$

$$|\vec{C}| = \sqrt{(-3)^2} = \sqrt{9} = 3$$

$$\frac{|4(-1)+3(-3)-12|}{\sqrt{3^2+4^2}} = 5$$

Pero $|\vec{C}| = D(C, \Pi_1)$, debido a que $C \in \Pi_1$

Solo cumple en $r = -1$

$$C = (4, -1, 3) \quad r = -1 \quad C = (4, -1, 3)$$

$$\text{rest} = 5$$

$$\therefore S: (x-4)^2 + (y+1)^2 + (z+3)^2 = 25$$

16)

$$\begin{pmatrix} 1 & B^2-B & 2 & 1 & B+2 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & B^2-1 & 1 & B^2-1 \\ 0 & 0 & B-1 & 1 & B-1 \\ 1 & & & & \end{pmatrix}$$

$$\text{II}_4: B-1(z) = B-1$$

$$\text{Si } B=1 \quad (1-1)(z) = 1-1$$

$0=0$ Tautología ; $z \in \mathbb{R}$

$$\text{II}_3: (B^2 - 1)(z) = B^2 - 1$$

$$(1^2 - 1)z = (1^2 - 1)$$

$0=0$ Tautología ; $z \in \mathbb{R}$

$$\text{II}_2: (B^2 - B)y = 0$$

$$(1^2 - 1)y = 0$$

$0=0$ Tautología ; $y \in \mathbb{R}$

$$\text{II}_1: x + By + 2z = B+2$$

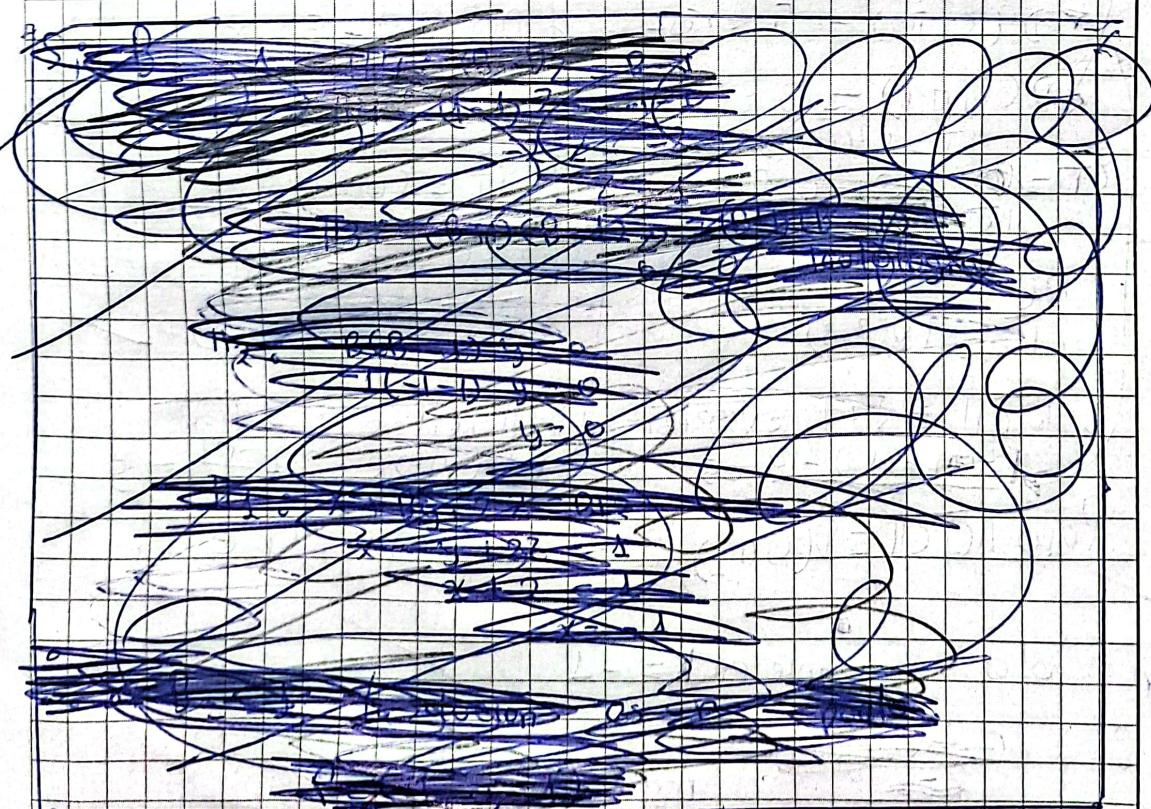
$$x + 0y + 2z = 1+2$$

$$x + y + 2z = 3$$

$$x + y + 2z - 3 = 0$$

La solución Si $B=1$ es un plano;

$$P = x + y + 2z - 3 = 0$$



$$\text{Si } B=0$$

$$\text{II}_4: (B-1)z = B-1$$

$$-1z = -1$$

$$z = 1$$

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$$\text{II}_3: (\beta^2 - 1)z = \beta^2 - 1$$

$$-1 \cancel{z} = -1$$

$$\cancel{z} = 1$$

$$\text{II}_2: \beta(\beta - 1)y = 0$$

$$0 = 0 \quad \text{Tautología}$$

Como nos va a faltar una ecuación,
la creamos.

$$y = t; t \in \mathbb{R}$$

~~X~~

$$\text{II}_1: x + \beta y + 2z = \beta + 2$$

$$x + 2 = 2$$

$$x = 0$$

$$\begin{cases} x = 0 + t \\ y = 0 + t \\ z = 1 + t \end{cases}$$

Si $P = (0, 0, 1) + (0, 1, 0)t$, $t \in \mathbb{R}$ es una recta

Ahora, si $\beta \neq 0$,

$$\text{II}_4: (\beta - 1)z = \beta - 1$$

$$\text{II}_3: (\beta^2 - 1)y = (\beta^2 - 1)$$

$$y = 1$$

$$\beta = -1$$

$$\text{II}_2: (\beta^2 - \beta)y = 0$$

$$y = 0$$

$$\text{II}_1: x + \beta y + 2z = \beta + 2$$

$$x + 2 = \beta + 2$$

$$x = \beta$$

Si $\beta \in \mathbb{R} - \{0, 1\}$ la solución es un punto

$$P = (\beta, 0, 1)$$

No existen valores de $\beta \in \mathbb{R}$ que hagan que el sistema no tenga solución

Profe, si llegó hasta esta parte del examen,
gracias. Por todo, ~~me encanta~~ aprendí bastante y
~~me encanta~~ me gustó el curso. Ojalá volverlo a tener como prof.
Pd. Perdona por la letra en egipcio. Atte: Mjuel Ruiz. ~~Mjuel Ruiz~~

Corrección: si $\beta = -1$

$$\text{II}_4: (-1 - 1)z = -1 - 1$$

$$-2z = -2$$

$$z = 1$$

$$\text{II}_3: (\beta + 1)(\beta - 1)y = (\beta + 1)(\beta - 1) \cancel{y} = 0$$

$$\cancel{y} = 0 \quad \text{Tautología}$$

$$\text{II}_2: \beta(\beta - 1)y = 0$$

$$-1(-1 - 1)y = 0$$

$$y = 0$$

$$\text{II}_1: x + \beta y + 2z = \beta + 2$$

$$x + 2 = -1 \quad x = -1$$

Si $\beta = -1$, la solución
es un punto

$$P = (-1, 0, 1)$$