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15) $A = \begin{vmatrix} m & m^2+1 & m \\ -1 & m & 1 \\ m^2+1 & 0 & 1 \end{vmatrix}$

$m(m-0) = m^2$

$-(m^2+1)(-1-(m^2+1)) = -(m^2+1)(m^2+2)$

$m(-1 \cdot 0 - m(m^2+1)) = -m^2(m^2+1)$

$m^2(m^2+1) = m^4 + m^2$

$det = (m^2 + 3m^2 - m^2) + 2 = 3m^2 + 2$

U, V, W formam uma base para o espaço independente de M

16)

A) $M \begin{vmatrix} 1 & 1 & 1 \\ 1 & 0 & 1 \\ 0 & 1 & -1 \end{vmatrix}$ $det = 1 \neq 0$ C é uma base de $\mathbb{R}^3$

B) $V(2,3,4) \rightarrow (2,3,4)_B$

C) $V = a f_1 + b f_2 + c f_3$

$f_1 = (1,1,0)$ $\quad a+b+c = 2$ $\quad a = 3-c$

$f_2 = (1,0,1)$ $\quad a+b = 3$ $\quad b = 4+c$

$f_3 = (1,1,-1)$ $\quad b-c = 4$ $\quad a = 3-(-8) = 11$

As coordenadas de V na C $\quad b = 4 + -8 = -1$

$(a,b,c) = (11,-1,-8)$

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13) A)

$U = (2, -1)$

$V = (1, -1)$

$2a + b = 1$

$-a - b = 1$

$2a + b = 1$

$(2a+b) - (a+b) = 1 - (-1) \Rightarrow a = 2$

$b = -1 - a = -1 - 2 = -3$

$W = 2U - 3V$

B) $a = (1, 1, 1)$

$b = (0, 1, 1)$

$c = (1, 1, 0)$

$\alpha(1,1,1) + \beta(0,1,1) + \gamma(1,1,0)$

$\alpha + \gamma = 1$

$\alpha + \beta + \gamma = 2$

$\alpha + \beta = 3$

$\beta = 3 - \alpha$

$\alpha + (3 - \alpha) + \gamma = 2$

$3 + \gamma = 2 = \gamma =$

$\alpha + \gamma = 1 \quad \alpha - 1 = 1 \quad \alpha = 2$

$\beta = 1$

14)

A) $U = (1, m, -1, m)$, $V = (m, 2m, 4)$

$V = \lambda U = (m, 2m, 4) = \lambda(1, m, -1, m)$

$m = \lambda \cdot 1 \quad \lambda = m$

$2m = \lambda(m-1) = m(m-1)$

$4 = \lambda m = m^2$

$2m = -2(-2-1) = 6 \quad m = 3$

$m^2 = 4 \quad m = \pm 2$

caso $m = 2$ $\quad m = 3$

caso $m = -2$ $\quad (m, n) = (2, 1)$ ou $(-2, 3)$

B) $U = (1, m, m+1)$

$V = (m, m+1, 8)$

$V = \lambda \bar{U} \rightarrow (m, m+1, 8) = \lambda(1, m, m+1)$

$$\begin{cases} m = \lambda \cdot 1 \quad \lambda = m \\ m+1 = \lambda m = m^2 \\ 8 = \lambda(m+1) = m(m+1) \end{cases}$$

$8 = m^3 \quad m = 2$

$m + 1 = m^2 \quad m = 3$

$m, m \cdot (2, 3)$

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B) $t = au + bV + cW$

$u + t = (1+a)u + bV + cW$ $\quad a(u+t) + b(V+t) + c(W+t) = 0$

$V + t = au + (b+1)V + cW$

$W + t = au + bV + (1+c)W$

$u = \alpha + a(\alpha + \beta + \gamma)$ $\quad a+b+c = \cancel{0}\ -1$ LD

$V = \beta + b(\alpha + \beta + \gamma)$ $\quad \alpha + \beta + \gamma = 0$ LI

$W = \gamma + c(\alpha + \beta + \gamma)$

11)

A) $A = (1,3,2)$ $\quad AB(0,-3,-3)$ $\quad$ B) $AB - \frac{2}{3}\vec{BC} = (0, -\frac{11}{3}, -\frac{11}{3})$

$B = (1,0,-1)$ $\quad BC(0,1,1)$ $\quad$ C) $C + \frac{1}{2}AB = (1, -0{,}5, -1{,}5)$

$C = (1,1,0)$ $\quad CA(0,2,2)$ $\quad$ D) $-\frac{2}{3}BC = (1, \frac{2}{3}, \frac{4}{3})$

12)

a) $2\alpha = 0$ $\quad \alpha = 0$ $\quad$ LI

$3\alpha + 2\beta = 0$ $\quad 2\beta = 0$ $\quad \beta = 0$

b) $(3,0)(1,0) = -\frac{3}{2}(-2,0) \rightarrow$ LD

c) $2\alpha = 0$ $\quad \alpha = 0 \rightarrow$ LI

$3a + 3b = 0$ $\quad b = 0$

D) $(1\ 1\ 2)$

~~( )~~ $\quad (1\ -1\ 1) = \frac{1}{2}(1\ -1\ 2) + [1\ 1\ 0] \rightarrow$ LD

$(1\ -1\ 1)$

$(0\ 0\ 1)$

E) $\begin{vmatrix} 1 & -1 & -1 \\ -1 & 2 & 2 \\ 1 & 1 & 2 \end{vmatrix} 0 = 1$ LD

F) $(2,0,5) = 2(1,0,1) + 3(0,0,1)$

LD

04

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A) $AC = \cancel{2u - 3v} + 2v + 5u$ B) AD e BC não paralelos e opostos logo ABCD é um trapézio

$BD = -2v + 3u$

6)

$a = OA$

$b = OB$ $DE = OE - OD$

$c = OC$ $OE = OB + BE = b + \frac{5a}{6}$

$\frac{c}{4} = AD$ $DE = OE - OD = b - \frac{a}{6} - \frac{c}{4}$

$\frac{5a}{6} = BE$

7) $OA = a + 2b$ $AC = OC - OA = (5a + xb) - (a + 2b) = a(5-1)b(x-2$

$OB = 3a + 2b$ $4a + (x-2)b$

$OC = 5a + xb$ $BC = OC - OB = (5a + xb) - (3a + 2b) = 2a + (x-2)b$

$4a + (x-2)b = \lambda(2a + (x-2)\vec{b})$ $4 = 2\lambda$ $\lambda = 2$ $-x = -2$ $x = 2$

8)

$OA = a$ $\vec{ON} = a + b$ $ON = OA + b = a + b$

$Om = b$ $\vec{Om} = \vec{b}$ $OB = \frac{1}{m} ON = \frac{1}{m}(a + b)$

$\vec{AM} = \vec{b}$ $OC = \frac{1}{1+m} Om = \frac{1}{1+m}\vec{b}$

$M = \vec{A} + \vec{b}$ $AC = OC - OA = \frac{1}{1+m} b - a + \frac{1}{1+m} b$

$AC = k \cdot \vec{AB}$

$AB = \left(\frac{1}{m} - 1\right)\vec{a} + \frac{1}{m} b$

$AC = -a + \frac{1}{1+m} b$ assim A B e C não colineares

9) $2a + l = 0$ $4l + l = 0$ são independentes e também

$a - 2l = 0$ $5l = 0$ geram um plano

$a = 2l$ $l = 0$

$a = 0$

10) a) $a + b + c = 0$

$a - b + \cancel{c} = 0$ $a = b = 0$

$c = 0$ todos são L.I (linear independente.

FORONI

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1)

A) $\vec{BF}$ = AB = -b   AF = F = F - b

B) AG = AF : F + t   FG : t c = F + c + b   i) 2AD - FG - BH + GH

C) AE = AE = AF + FE -> AE = 1·b

D) BG = BA + AG -> BG = -b + c

E) HB = HG + GB

F) AB + FG = -b + c -> B + (-B) + c -> $\vec{c}$

G) AD + HG

H) HF - AG - EF

2) A) $\vec{DF}$ = DE + EF = $\vec{DE}$ - $\vec{DC}$ E) EC = -DE + DC

B) $\vec{DA}$ = DE + EF + FA = DE - DC - DE = -$\vec{DC}$ F) EB = -DE + DC .. DE = -2DE + DC

C) $\vec{DB}$ = DC + CB = DC - DE   G) $\vec{OB}$

D) DO   H) $\vec{AF}$ = - DC

3)

OD = d   OE = e

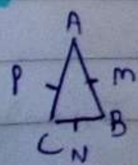
A) OA + OB + OC + OD + OE + OF -> 0   E) O C + AF + EF -> (-D - E) + 2E +

B) AB + BC + CD + DE + EF + FA = 0

C) AB + BC + CD + DE + EF + AF = 2DE   F) 2E + DE + OE -> 2E - E - D -> 3E - D

D) OA + OB + Od + OG -> OA + OB + D + E -> OA = -OD -> OB = -OG -> -D - E + D + E = 0

4)

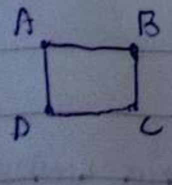


$BP = -AB + \frac{CA}{2} = -AB + (-\frac{AC}{2}$

$AN = AB(-\frac{AB + AC}{2}) = \frac{AB}{2} + \frac{AC}{2}$

$CM = -AC + \frac{AB}{2}$

5)



AD = 5U   A) CD = ~~-AB = -2V~~ CA + AD

BC = 3U   -AC = -(AB + BC) = -2V - 3U + 5U =

AB = 2V   -2V + 2U