13 u 3
u 5

a) $\begin{vmatrix} 0 & -8 & 5 & 1 \\ 0 & -1 & 6 & 1 \\ -6 & -7 & 5 & 1 \\ 6 & -9 & 0 & 0 \end{vmatrix} = 6 \cdot (-1)^{4+1} \begin{vmatrix} -8 & 5 & 1 \\ -1 & 6 & 1 \\ -7 & 5 & 1 \end{vmatrix} + -9 \cdot (-1)^{(4+2)} \begin{vmatrix} 0 & 5 & 1 \\ 0 & 6 & 1 \\ -6 & 5 & 1 \end{vmatrix} +$

$0 \cdot (-1)^{(4+3)} \dots + 0 (-1)^{(4+4)} \dots = -6 \left[-8(-1)^{(1+1)} \begin{vmatrix} 6 & 1 \\ 5 & 1 \end{vmatrix} + 5(-1)^{(1+2)} \begin{vmatrix} -1 & 1 \\ -7 & 1 \end{vmatrix} + \right.$

$\left. + 1 (-1)^{(1+3)} \begin{vmatrix} -1 & 6 \\ -7 & 5 \end{vmatrix} \right] + (-9) \left[0 \cdot (-1)^{(1+1)} \dots + 5 \cdot (-1)^{(1+2)} \begin{vmatrix} 0 & 1 \\ -6 & 1 \end{vmatrix} + 1 \cdot (-1)^{(1+3)} \begin{vmatrix} 0 & 6 \\ -6 & 5 \end{vmatrix} \right] =$

$= (-6) \cdot \left[-8 \cdot (6 \cdot 1 - 1 \cdot 5) - 5 \cdot (+1) \cdot 1 - 1 \cdot (-7) \right) + 1 \cdot \left((-1) \cdot 5 - 6 \cdot (-7) \right) \Big] +$

$+ (-9) \cdot \left[-5 (0 \cdot 1 - 1 \cdot (-6) + 1 (0 \cdot 5 - 6 \cdot (-6)) \right] =$

$= (-6) \cdot [-8 - 30 + 37] + (-9) [-30 + 36] =$

$= (+6) + (-54) =$ ~~-60~~ -48 ✓

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b) $\begin{vmatrix} -4 & 4 & -6 & 3 \\ 5 & 4 & -6 & 6 \\ 4 & -1 & 3 & 1 \\ -9 & 9 & -9 & -9 \end{vmatrix} = -4 \cdot (-1)^{(1+1)} \begin{vmatrix} 4 & -6 & 6 \\ -1 & 3 & 1 \\ 9 & -9 & -9 \end{vmatrix} + 4 (-1)^{(1+2)} \begin{vmatrix} 5 & -6 & 6 \\ 4 & 3 & 1 \\ -9 & -9 & -9 \end{vmatrix} +$

$+ (-6) (-1)^{(1+3)} \begin{vmatrix} 5 & 4 & 6 \\ 4 & -1 & 1 \\ -9 & 9 & -9 \end{vmatrix} + 3 (-1)^{(1+4)} \begin{vmatrix} 5 & 4 & -6 \\ 4 & -1 & 3 \\ -9 & 9 & -9 \end{vmatrix} =$

$= (-4) \cdot \left[4 (-1)^{(1+1)} \begin{vmatrix} 3 & 1 \\ -9 & -9 \end{vmatrix} + (-6) (-1)^{(1+2)} \begin{vmatrix} -1 & 1 \\ 9 & -9 \end{vmatrix} + 6 (-1)^{(1+3)} \begin{vmatrix} -1 & 3 \\ 9 & -9 \end{vmatrix} \right] \oplus$

$\oplus (-4) \left[5 \cdot (-1)^{(1+1)} \begin{vmatrix} 3 & 1 \\ -9 & -9 \end{vmatrix} + (-6) (-1)^{(1+2)} \begin{vmatrix} 4 & 1 \\ -9 & -9 \end{vmatrix} + 6 (-1)^{(1+3)} \begin{vmatrix} 4 & 3 \\ -9 & -9 \end{vmatrix} \right] \oplus$

$\oplus (-6) \left[5 (-1)^{(1+1)} \begin{vmatrix} -1 & 1 \\ 9 & -9 \end{vmatrix} + 4 (-1)^{(1+2)} \begin{vmatrix} 4 & 1 \\ -9 & -9 \end{vmatrix} + 6 (-1)^{(1+3)} \begin{vmatrix} 4 & -1 \\ -9 & 9 \end{vmatrix} \right] \oplus$ $\oplus$

$\oplus -3 \left[5 (-1)^{(1+1)} \begin{vmatrix} -1 & 3 \\ 9 & -9 \end{vmatrix} + 4 (-1)^{(1+2)} \begin{vmatrix} 4 & 3 \\ -9 & -9 \end{vmatrix} + (-6) (-1)^{(1+3)} \begin{vmatrix} 4 & -1 \\ -9 & 9 \end{vmatrix} \right] =$

11

13(8)
N 5

$= (-4)[4\cdot(3\cdot(-9)-1\cdot(-9))+6((-1)\cdot(-9)-1\cdot 9)+((-1)\cdot(-9)-3\cdot 9)]+$

$+(-4)[5(3\cdot(-9)-1\cdot(-9))+6(4\cdot(-9)-1\cdot(-9))+6(4\cdot(-9)-3\cdot(-9))]+$

$+(-6)[5((-1)(-9)-1\cdot 9)+(-4)(4\cdot(-9)-1\cdot(-9))+6(4\cdot 9-(-1)(-9))]+$

$+(-3)[5(-1)\cdot(-9)-3\cdot 9)+(-4)(4\cdot(-9)-3(-9))+(-6)(4\cdot 9-(-1)(-9))] =$

$= (-4)[4((-27-(-9))+6(9-9)+6(9-27)]+$

$+(-4)[5(-27-(-9))+6(-36-(-9))+6(-36-(-27))+$

$+(-6)[5(9-9)+(-4)(-36-(-27))+(-6)(36-9)]+$

$+(-3)[5(9-27)+(-4)(-36-(-27)+(-6)(36-9)] =$

$= -16(-18)-24(0)-24(-18)+-20(-18)-24(-27)-24(-9)+$

$(-30)\cdot 0+24(-27)+36\cdot 27-15(-18)+12(-9)+18\cdot 27 =$

$= 288-0+432+360+648+216+0-648-972+270+$

$108+486 = \boxed{972}$.

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c) $\begin{vmatrix} -2 & -3 & -6 & -9 \\ -9 & 5 & 4 & -5 \\ -7 & -3 & 4 & 3 \\ -8 & -5 & -2 & -7 \end{vmatrix} = (-2)(-1)^{1+1}\begin{vmatrix} 5 & 4 & -5 \\ -3 & 4 & 3 \\ -5 & -2 & -7 \end{vmatrix} + (-3)(-1)^{1+2}\begin{vmatrix} -9 & 4 & -5 \\ -7 & 4 & 3 \\ -8 & -2 & 7 \end{vmatrix} +$

$+(-6)(-1)^{(1+3)}\begin{vmatrix} -9 & 5 & -5 \\ -7 & -3 & 3 \\ -8 & -5 & -7 \end{vmatrix} + (-9)(-1)^{(1+4)}\begin{vmatrix} -9 & 5 & 4 \\ -7 & -3 & 4 \\ -8 & -5 & -2 \end{vmatrix} =$

$= (-2)\left[5(-1)^{(1+1)}\begin{vmatrix} 4 & 3 \\ -2 & -7 \end{vmatrix} + 4\cdot(-1)^{(1+2)}\begin{vmatrix} -3 & 3 \\ -5 & -7 \end{vmatrix} + (-5)(-1)^{(1+3)}\begin{vmatrix} -3 & 4 \\ -5 & -2 \end{vmatrix}\right] +$

$+3\left[(-9)(-1)^{(1+1)}\begin{vmatrix} 4 & 3 \\ -2 & -7 \end{vmatrix} + 4\cdot(-1)^{(1+2)}\begin{vmatrix} -7 & 3 \\ -8 & -7 \end{vmatrix} + (-5)(-1)^{(1+3)}\begin{vmatrix} -7 & 4 \\ -8 & -2 \end{vmatrix}\right] +$

$+(-6)\left[(-9)(-1)^{(1+1)}\begin{vmatrix} -3 & 3 \\ -5 & -7 \end{vmatrix} + 5(-1)^{(1+2)}\begin{vmatrix} -7 & 3 \\ -8 & -7 \end{vmatrix} + (-5)(-1)^{(1+3)}\begin{vmatrix} -7 & -3 \\ -8 & -5 \end{vmatrix}\right] +$

$+9\left[(-9)(-1)^{(1+1)}\begin{vmatrix} -3 & 4 \\ -5 & -2 \end{vmatrix} + 5(-1)^{(1+2)}\begin{vmatrix} -7 & 4 \\ -8 & -2 \end{vmatrix} + 4(-1)^{(1+3)}\begin{vmatrix} -7 & -3 \\ -8 & -5 \end{vmatrix}\right] =$

1.2.

A3 N5
N5

$= (-10)(4\cdot(-7) - 3(-2)) + 8(21-(-15)) + 10(6-(-20)) +$

$+ (-27)(-28-(-6)) + (-12)(49-(-24)) + (-15)(14-(-32)) +$

$+ 54(21-(-15)) + 30(49-(-24)) + 30(35-24) +$

$+ (-81)(6-(-20)) + (-45)(14-(4\cdot(-8))) + 36(35-24) =$

$= 220 + 288 + 260 + 594 - 300 - 690 +$

$+ 324 + 2190 + 330 - 2106 + 2070 + 396 = -564$

$= 220 + 288 + 260 + 594 - 876 - 690 +$

$+ 1944 + 2190 + 330 - 2106 - 2070 + 396 =$

$= \boxed{480}$

1.3