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«مسأله حل»

زهرا تشکر ارانی ۹۵۳۱۰۷۴

• دترمینان ماتریس های زیر را بیابید.

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 8 & 9 & 4 \\ 7 & 6 & 5 \end{bmatrix}$$

$$\det A = 1 \times \det \begin{bmatrix} 9 & 4 \\ 6 & 5 \end{bmatrix} - 2 \times \det \begin{bmatrix} 8 & 4 \\ 7 & 5 \end{bmatrix} + 3 \times \det \begin{bmatrix} 8 & 9 \\ 7 & 6 \end{bmatrix}$$

$$\Rightarrow \det A = (45 - 24) - 2(40 - 28) + 3(48 - 63)$$

$$\Rightarrow \det A = 21 - 2(12) + 3(-15) = 21 - 24 - 45$$

$$\Rightarrow \boxed{\det A = -48}$$

$$B = \begin{bmatrix} 1+x & 2+x & 3+x \\ 8+x & 9+x & 4+x \\ 7+x & 6+x & 5+x \end{bmatrix}$$

$$\det B = (1+x) \times \det \begin{bmatrix} 9+x & 4+x \\ 6+x & 5+x \end{bmatrix} - (2+x) \times \det \begin{bmatrix} 8+x & 4+x \\ 7+x & 5+x \end{bmatrix}$$

$$+ (3+x) \times \det \begin{bmatrix} 8+x & 9+x \\ 7+x & 6+x \end{bmatrix}$$

$$\Rightarrow \det B = (1+x)\left((9+x)(8+x)-(4+x)(7+x)\right)$$
$$-(2+x)\left((8+x)(5+x)-(4+x)(6+x)\right)$$
$$+(3+x)\left((8+x)(7+x)-(9+x)(6+x)\right)$$

$$\det B = (1+x)(x^2+14x+53-x^2-10x-24)$$
$$-(2+x)(x^2+12x+40-x^2-11x-28)$$
$$+(3+x)(x^2+14x+48-x^2-12x-24)$$

$$\Rightarrow \det B = (1+x)(4x+21)-(2+x)(2x+12)+(3+x)(-2x-10)$$

$$\det B = 4x^2+25x+21-(2x^2+16x+24)+(-2x^2-21x-30)$$

$$\Rightarrow \det B = -12x-83$$

$$C = \begin{bmatrix} x & x^2 & x^3 \\ x^8 & x^9 & x^4 \\ x^6 & x^7 & x^5 \end{bmatrix}$$

$$\det C = x \times \det \begin{bmatrix} x^9 & x^4 \\ x^7 & x^5 \end{bmatrix} - x^2 \times \det \begin{bmatrix} x^8 & x^4 \\ x^6 & x^5 \end{bmatrix} + x^3 \times \det \begin{bmatrix} x^8 & x^9 \\ x^6 & x^7 \end{bmatrix}$$

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$$\Rightarrow \det C = x\left(x^{14} - x^{10}\right) - x^{2}\left(x^{13} - x^{11}\right) + x^{4}\left(x^{12} - x^{10}\right)$$

$$\det C = x^{15} - x^{11} - x^{15} + x^{13} + x^{17} - x^{19}$$

$$\det C = x^{13} - x^{11} + x^{17} - x^{19} = x^{11}\left(x^{2} - 1\right) - x^{17}\left(x^{2} - 1\right)$$

$$\Rightarrow \det C = \left(x^{2} - 1\right)\left(x^{11} - x^{17}\right)$$