

$$A = \begin{bmatrix} 4 & 8 & -1 & -2 \\ -2 & -9 & -2 & -4 \\ 0 & 10 & 5 & -10 \\ -1 & -13 & -14 & -13 \end{bmatrix}, \det(A - xI) = 0$$

$$xI = \begin{bmatrix} x & 0 & 0 & 0 \\ 0 & x & 0 & 0 \\ 0 & 0 & x & 0 \\ 0 & 0 & 0 & x \end{bmatrix}, A - xI = \begin{bmatrix} + & - & + & - \\ 4-x & 8 & -1 & -2 \\ -2 & -9-x & -2 & -4 \\ 0 & 10 & 5-x & -10 \\ -1 & -13 & -14 & -x-2 \end{bmatrix}$$

$$\det(A - xI) \Rightarrow 4-x \left| \begin{array}{cccc} -9-x & -2 & -4 \\ 10 & 5-x & -10 \\ -14 & -13-x \end{array} \right| - 3 \left| \begin{array}{ccc} -2 & -2 & -4 \\ 0 & 5-x & -10 \\ -1 & -14 & -13-x \end{array} \right|$$

**B**

$$-1 \left| \begin{array}{cccc} -2 & -9-x & -4 \\ 10 & -10 & -10 \\ -1 & 13 & -13-x \end{array} \right| + 2 \left| \begin{array}{ccc} -2 & -9-x & -2 \\ 0 & 10 & 5-x \\ -1 & 13 & -14 \end{array} \right|$$

**C**

**D**

$$\{1\} \rightarrow 4-x \begin{vmatrix} -9-x & -2 & -4 \\ 10 & 5-x & -10 \\ -13 & -14 & -13-x \end{vmatrix}$$

058

$$4-x \left[ -9-x((5-x)(-13-x) - (-140)) + 2(10(-13-x) - (-130)) - 4(-140) - (-13)(5-x) \right]$$

$$4-x \left[ -9-x(-65-5x+13x+x^2 - 140) + 2(-130-10x - 130) - 4(-140 - (-65+13x)) \right]$$

$$4-x(-9-x(-205+8x+x^2) + 2(-260-10x) - 4(-140+65-13x))$$

$$4-x(-9-x(205+8x+x^2) + 2(-520-20x) - 4(-75-13x))$$

$$4-x(1875-72x-9x^2 + 205x - 8x^2 - x^3 - 520 - 20x + 300 + 52x)$$

$$4-x(-x^3 - 17x^2 + 165x + 1625)$$

$$-4x^3 - 68x^2 + 660x + 6500 + x^4 + 17x^3 - 165x^2 + 1625x$$

$$\Rightarrow x^4 + 13x^3 - 233x^2 - 965x + 6500$$

11

$$-8 \left| \begin{array}{ccc|c} & t & - & + \\ & -2 & -2 & -4 \\ 0 & 5-x & -10 & | \\ -1 & -14 & -13-x & \end{array} \right\} 2$$

$$\begin{aligned}
 & -8 \left( -2((5-x)(-13-x) - (-140)) + 2(-2)(-13-x) - \right. \\
 & \quad \left. - 8(-2(5-x)(-13-x) - (-140)) + 2(0 - 10) - 4(0 - ((-1)(5-x))) \right) \\
 & = -8(-2(-65x^2 - 5x + 13x + x^2 - 140) - 20 - 4(0 - (x - 5))) \\
 & = -8(-2(x^2 + 8x - 205) - 20 - 4(- (x - 5))) \\
 & = -8(-2(x^2 + 8x - 205) - 20 - 4(5 - x)) \\
 & = -8(-2x^2 - 16x + 410 - 20 - 20 + 4x) \\
 & = 8(-2x^2 - 12x + 370)
 \end{aligned}$$

$$\cancel{16x^2 + 96x - 1850} =$$

$$16x^2 + 96x - 2960$$

$$05\% - \begin{array}{c|ccc} & + & - & + \\ -1 & \left| \begin{array}{ccc} -2 & -9x & -4 \\ 0 & 10 & -10 \\ -1 & -13 & -13-x \end{array} \right| \end{array}$$

3

$$-1 \left( -2((10)(-13-x) - (-130)) + 9+x(0 - (10)) - 4(0 - (-10)) \right)$$

$$-1(-2(-130 - 10x - 130) + 9+x(-10) - 4(-10))$$

$$-1(-2(-260 - 10x) + 9+x(-10) - 40)$$

$$-1(+520 + 20x - 90 - 10x - 40)$$

$$-1(520 - 40 - 90 + 20x - 10x)$$

~~$$-520 + 40 + 90 + 20x - 10x$$~~

~~$$-390$$~~

$$-520 + 40 + 90 - 20x + 10x$$

$$-10x - 390 //$$

$$t_2 \left| \begin{array}{ccc} -2 & -9-x & -\frac{1}{2} \\ 0 & 10 & 5-x \\ -1 & -13 & -14 \end{array} \right|$$

4

$$2 \left( -2((-140) - (-65 + 13x)) + 9+x(0 - (-1)(5-x)) - 2(0 - (-10)) \right)$$

$$2(-2(-140 + 65 - 13x) + 9+x(0 - (-5+x)) - 2(0 + 10))$$

$$2(-2(-75 - 13x) + 9+x(\cancel{-5} - x)) - 2(10)$$

$$2(-2(-75 - 13x) + 95 - 9x + 5x - x^2 - 20)$$

$$2(150 + 26x + 45 - 4x - x^2 - 20)$$

$$2(130 + 22x + 45 - x^2)$$

$$2(130 + 45 + 22x - x^2)$$

$$2(175 + 22x - x^2)$$

$$350 + 44x - 2x^2$$

$$\det(A - xI) \Rightarrow$$

(1)

$$\cancel{x^4 + 13x^3 - 233x^2 - 965x + 6500} + 16x^2 + 96x - \cancel{2160}$$

(3)

$$\cancel{-10x - 320} + 350 + 44x - 2x^2$$

$$\Rightarrow x^4 + 13x^3 - 219x^2 - 835x + 3500$$