> *restart*

> *Ecuacion* := $x \cdot \cdot 2 + x + 1 = 0$

$$Ecuacion := x^2 + x + 1 = 0 \tag{1}$$

> *Raiz* := *solve*(*Ecuacion*)

$$Raiz := -\frac{1}{2} + \frac{1}{2} \, I \sqrt{3}, \; -\frac{1}{2} - \frac{1}{2} \, I \sqrt{3} \tag{2}$$

> *Raiz*$_1$

$$-\frac{1}{2} + \frac{1}{2} \, I \sqrt{3} \tag{3}$$

> Re($Raiz_1$)

$$-\frac{1}{2} \tag{4}$$

> Im($Raiz_1$)

$$\frac{1}{2} \sqrt{3} \tag{5}$$

> *Raiz*$_2$

$$-\frac{1}{2} - \frac{1}{2} \, I \sqrt{3} \tag{6}$$

> Re($Raiz_2$)

$$-\frac{1}{2} \tag{7}$$

> Im($Raiz_2$)

$$-\frac{1}{2} \sqrt{3} \tag{8}$$

> *EcuacionOriginal* := *expand*$\left(\left(x - Raiz_1 \right) \cdot \left(x - Raiz_2 \right) \right) = 0$

$$EcuacionOriginal := x^2 + x + 1 = 0 \tag{9}$$

COMENTARIO SOLICITADO POR EL ALUMNO

> *restart*

> *AA* := *array*([[1, 2], [-3, 4]])

$$AA := \begin{bmatrix} 1 & 2 \\ -3 & 4 \end{bmatrix} \tag{10}$$

> *BB* := *array*([[-2, 3], [5, 6]])

$$BB := \begin{bmatrix} -2 & 3 \\ 5 & 6 \end{bmatrix} \tag{11}$$

> *with*(*linalg*);

[*BlockDiagonal, GramSchmidt, JordanBlock, LUdecomp, QRdecomp, Wronskian, addcol,* $\tag{12}$
  addrow, adj, adjoint, angle, augment, backsub, band, basis, bezout, blockmatrix, charmat,
  charpoly, cholesky, col, coldim, colspace, colspan, companion, concat, cond, copyinto,
  crossprod, curl, definite, delcols, delrows, det, diag, diverge, dotprod, eigenvals,
  eigenvalues, eigenvectors, eigenvects, entermatrix, equal, exponential, extend, ffgausselim,

fibonacci, forwardsub, frobenius, gausselim, gaussjord, geneqns, genmatrix, grad, hadamard, hermite, hessian, hilbert, htranspose, ihermite, indexfunc, innerprod, intbasis, inverse, ismith, issimilar, iszero, jacobian, jordan, kernel, laplacian, leastsqrs, linsolve, matadd, matrix, minor, minpoly, mulcol, mulrow, multiply, norm, normalize, nullspace, orthog, permanent, pivot, potential, randmatrix, randvector, rank, ratform, row, rowdim, rowspace, rowspan, rref, scalarmul, singularvals, smith, stackmatrix, submatrix, subvector, sumbasis, swapcol, swaprow, sylvester, toeplitz, trace, transpose, vandermonde, vecpotent, vectdim, vector, wronskian]

> $CC := evalm(AA \&* BB)$

$$CC := \begin{bmatrix} 8 & 15 \\ 26 & 15 \end{bmatrix} \tag{13}$$

> $det(CC)$

$$-270 \tag{14}$$

> $InCC := inverse(CC)$

$$InCC := \begin{bmatrix} -\dfrac{1}{18} & \dfrac{1}{18} \\ \dfrac{13}{135} & -\dfrac{4}{135} \end{bmatrix} \tag{15}$$

> $Ident := evalm(CC \&* InCC)$

$$Ident := \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \tag{16}$$

> $SistemaSimultaneas := 2\,x + 3\,y = 4, -x + 5\,y = -3 : SistemaSimultaneas_1;$
> $SistemaSimultaneas_2;$

$$2\,x + 3\,y = 4$$
$$-x + 5\,y = -3 \tag{17}$$

> $Raices := solve(\{SistemaSimultaneas\}, \{x, y\});$

$$Raices := \left\{ x = \frac{29}{13}, y = -\frac{2}{13} \right\} \tag{18}$$

> $RR := array([[2, 3], [-1, 5]])$

$$RR := \begin{bmatrix} 2 & 3 \\ -1 & 5 \end{bmatrix} \tag{19}$$

> $VV := array([4, -3])$

$$VV := \begin{bmatrix} 4 & -3 \end{bmatrix} \tag{20}$$

> $Sol := linsolve(RR, VV)$

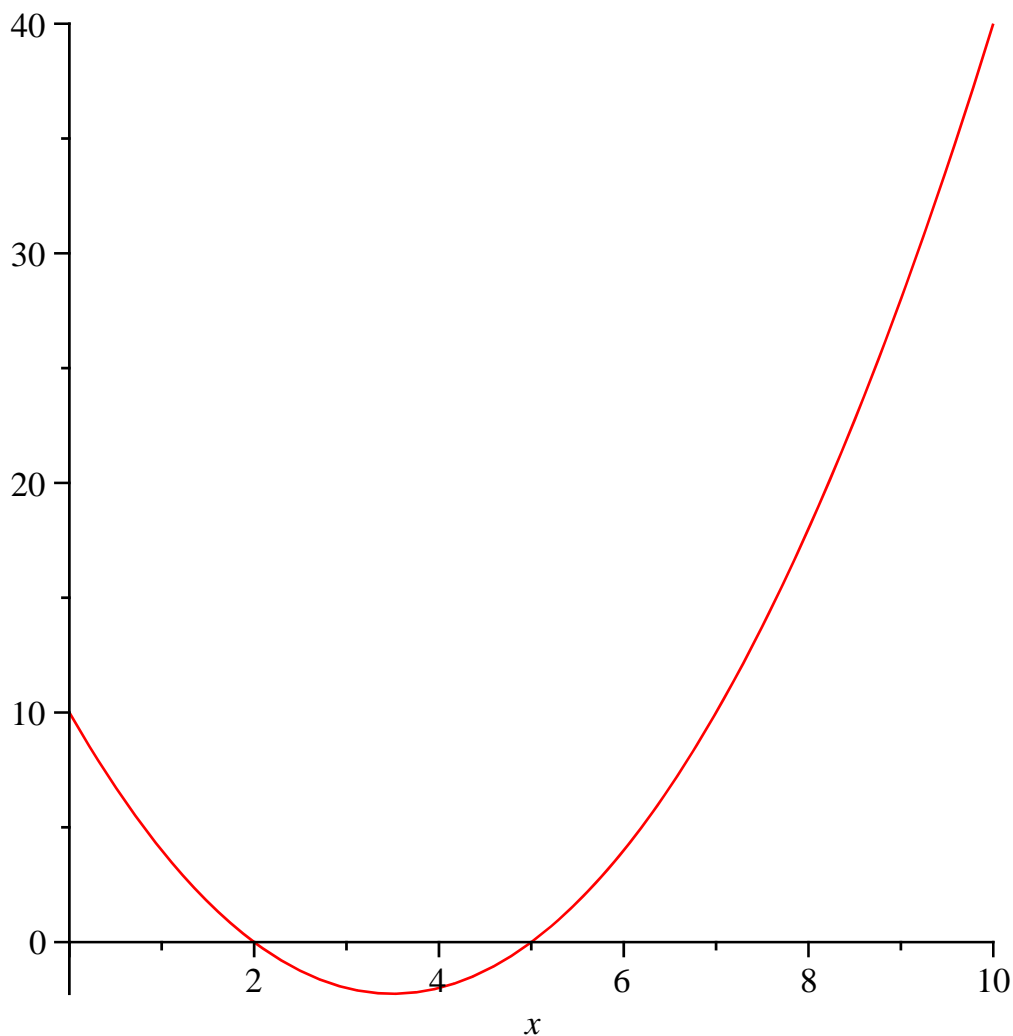$$Sol := \begin{bmatrix} \dfrac{29}{13} & -\dfrac{2}{13} \end{bmatrix} \tag{21}$$

> $Soluciones := evalm(inverse(RR) \&* VV)$

$$Soluciones := \begin{bmatrix} \dfrac{29}{13} & -\dfrac{2}{13} \end{bmatrix} \tag{22}$$

> *restart*

> *Ecuacion* := $x \cdot\cdot 2 - 7\,x + 10 = 0;$

$$Ecuacion := x^2 - 7\,x + 10 = 0 \tag{23}$$

> *Raiz* := *solve*(*Ecuacion*)

$$Raiz := 5, 2 \tag{24}$$

> *plot*(*lhs*(*Ecuacion*), $x = 0\,..10$)

> *restart*

> *SolucionGeneral* := $y(x) = C1 \cdot \sin(2\,x) + C2 \cdot \cos(2\,x)$

$$SolucionGeneral := y(x) = C1\,\sin(2\,x) + C2\,\cos(2\,x) \tag{25}$$

> *Sistema* := *diff*(*SolucionGeneral*, x), *diff*(*SolucionGeneral*, $x\$2$) : *Sistema*$_1$; *Sistema*$_2$;

$$\frac{\mathrm{d}}{\mathrm{d}x}\,y(x) = 2\,C1\,\cos(2\,x) - 2\,C2\,\sin(2\,x)$$

$$\frac{\mathrm{d}^2}{\mathrm{d}x^2}\,y(x) = -4\,C1\,\sin(2\,x) - 4\,C2\,\cos(2\,x) \tag{26}$$

> *Parametro* := *solve*({*Sistema*}, {*C1*, *C2*})

$$\tag{27}$$

$$Parametro := \left\{ C1 = \frac{1}{4} \frac{-\sin(2x)\left(\dfrac{d^2}{dx^2}y(x)\right) + 2\left(\dfrac{d}{dx}y(x)\right)\cos(2x)}{\sin(2x)^2 + \cos(2x)^2}, C2 = \right.$$

(27)

$$\left. -\frac{1}{4} \frac{\left(\dfrac{d^2}{dx^2}y(x)\right)\cos(2x) + 2\left(\dfrac{d}{dx}y(x)\right)\sin(2x)}{\sin(2x)^2 + \cos(2x)^2} \right\}$$

> $EcuacionIntermedia := simplify(subs(C1 = rhs(Parametro_1), C2 = rhs(Parametro_2),$
> $SolucionGeneral))$

$$EcuacionIntermedia := y(x) = -\frac{1}{4}\frac{d^2}{dx^2}y(x)$$

(28)

> $EcuacionFinal := -rhs(EcuacionIntermedia)\cdot 4 + lhs(EcuacionIntermedia)\cdot 4 = 0$

$$EcuacionFinal := \frac{d^2}{dx^2}y(x) + 4y(x) = 0$$

(29)

> $SolGral := dsolve(EcuacionFinal, y(x))$

$$SolGral := y(x) = \_C1\sin(2x) + \_C2\cos(2x)$$

(30)

> $Condiciones := y(0) = 5, D(y)(0) = -8$

$$Condiciones := y(0) = 5, D(y)(0) = -8$$

(31)

> $SolPart := dsolve(\{EcuacionFinal, Condiciones\}, y(x))$

$$SolPart := y(x) = -4\sin(2x) + 5\cos(2x)$$

(32)

> $restart$
> $y(x) := \sin(5x)$

$$y(x) := \sin(5x)$$

(33)

> $DerivadaSegunda := Diff(y(x), x, x) = diff(y(x), x\$2)$

$$DerivadaSegunda := \frac{d^2}{dx^2}\sin(5x) = -25\sin(5x)$$

(34)

> $Diff(x(t), t, t, t, t, t) = diff(x(t), t\$5)$

$$\frac{d^5}{dt^5}x(t) = \frac{d^5}{dt^5}x(t)$$

(35)

>
>
>