```
> 1 + 2
```

$$3 \tag{1}$$

```
> eq1 := diff(u(x), x$2) + 5·diff(u(x), x) - 7·u(x) = x^2 + 5·x - 7
```

$$eq1 := \frac{d^2}{dx^2} u(x) + 5 \frac{d}{dx} u(x) - 7 u(x) = x^2 + 5 x - 7 \tag{2}$$

```
> eq1 := dsolve(eq1, u(x))
```

$$eq1 := u(x) = e^{\frac{(-5+\sqrt{53})x}{2}} c_2 + e^{-\frac{(5+\sqrt{53})x}{2}} c_1 - \frac{x^2}{7} - \frac{45 x}{49} + \frac{104}{343} \tag{3}$$

```
> eq1
```

$$u(x) = e^{\frac{(-5+\sqrt{53})x}{2}} c_2 + e^{-\frac{(5+\sqrt{53})x}{2}} c_1 - \frac{x^2}{7} - \frac{45 x}{49} + \frac{104}{343} \tag{4}$$

```
> eq1 := rhs(eq1)
```

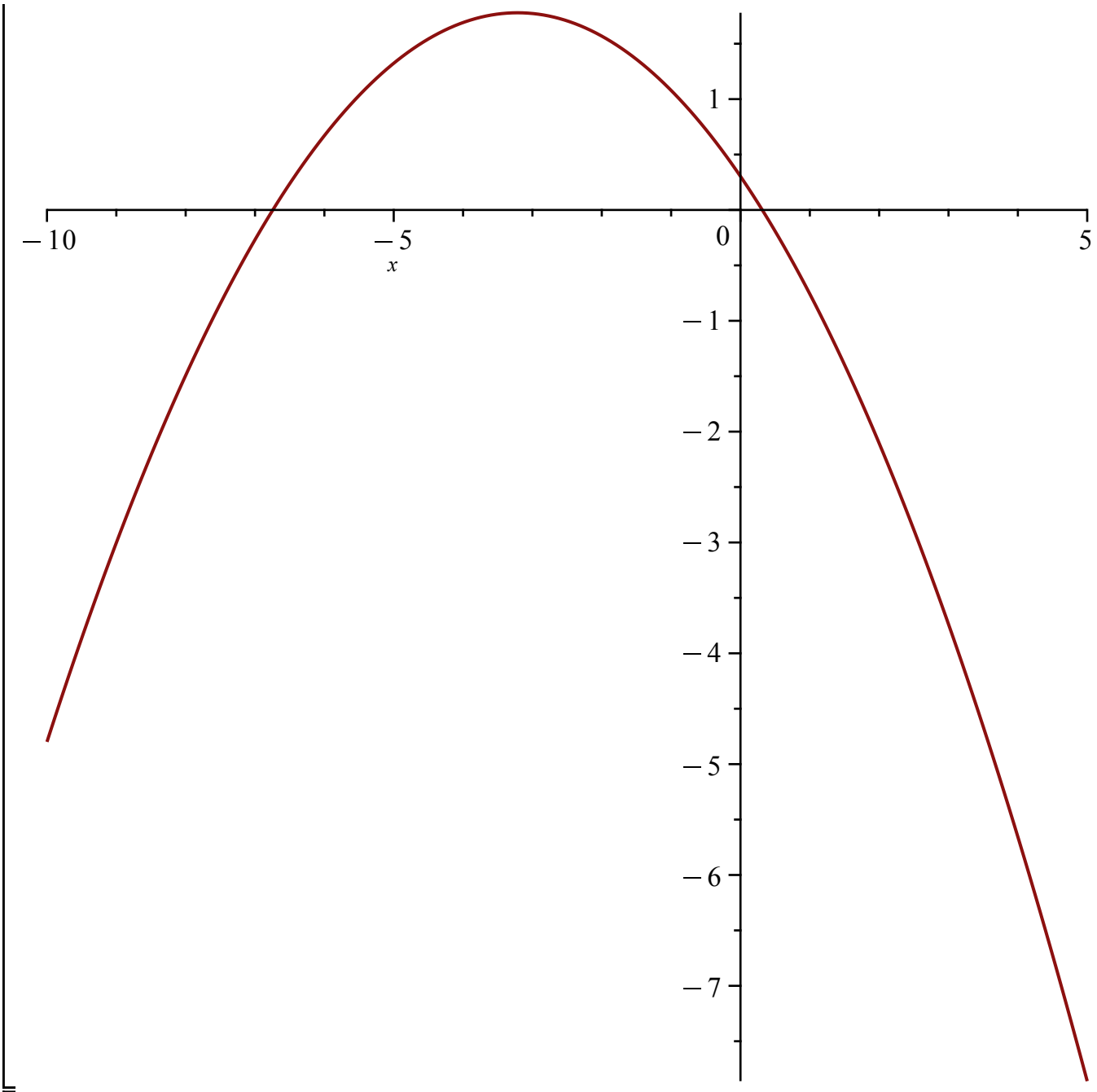
$$eq1 := e^{\frac{(-5+\sqrt{53})x}{2}} c_2 + e^{-\frac{(5+\sqrt{53})x}{2}} c_1 - \frac{x^2}{7} - \frac{45 x}{49} + \frac{104}{343} \tag{5}$$

```
>
```

```
> eq1 := -x^2/7 - 45*x/49 + 104/343
```

$$eq1 := -\frac{1}{7} x^2 - \frac{45}{49} x + \frac{104}{343} \tag{6}$$

```
> plot(eq1, x = -10..5)
```



> $f := x \to -\frac{1}{7}x^2 - \frac{45}{49}x + \frac{104}{343}$

$$f := x \mapsto -\frac{1}{7}\cdot x^2 - \frac{45}{49}\cdot x + \frac{104}{343} \quad \textbf{(7)}$$

> $f(x)$

$$-\frac{1}{7}x^2 - \frac{45}{49}x + \frac{104}{343} \quad \textbf{(8)}$$

> $f(1)$

$$-\frac{260}{343} \quad \textbf{(9)}$$

> $val := \mathrm{Pi}\cdot\mathrm{sqrt}(2)$

$$val := \pi \sqrt{2} \tag{10}$$

> $f(val)$

$$-\frac{2\pi^2}{7} - \frac{45\pi\sqrt{2}}{49} + \frac{104}{343} \tag{11}$$

> $eval(f(x), x = val)$

$$-\frac{2\pi^2}{7} - \frac{45\pi\sqrt{2}}{49} + \frac{104}{343} \tag{12}$$

> $f(2)$

$$-\frac{722}{343} \tag{13}$$

> $f(\mathrm{sqrt}(2))$

$$\frac{6}{343} - \frac{45\sqrt{2}}{49} \tag{14}$$

> $f(val)$

$$-\frac{2\pi^2}{7} - \frac{45\pi\sqrt{2}}{49} + \frac{104}{343} \tag{15}$$

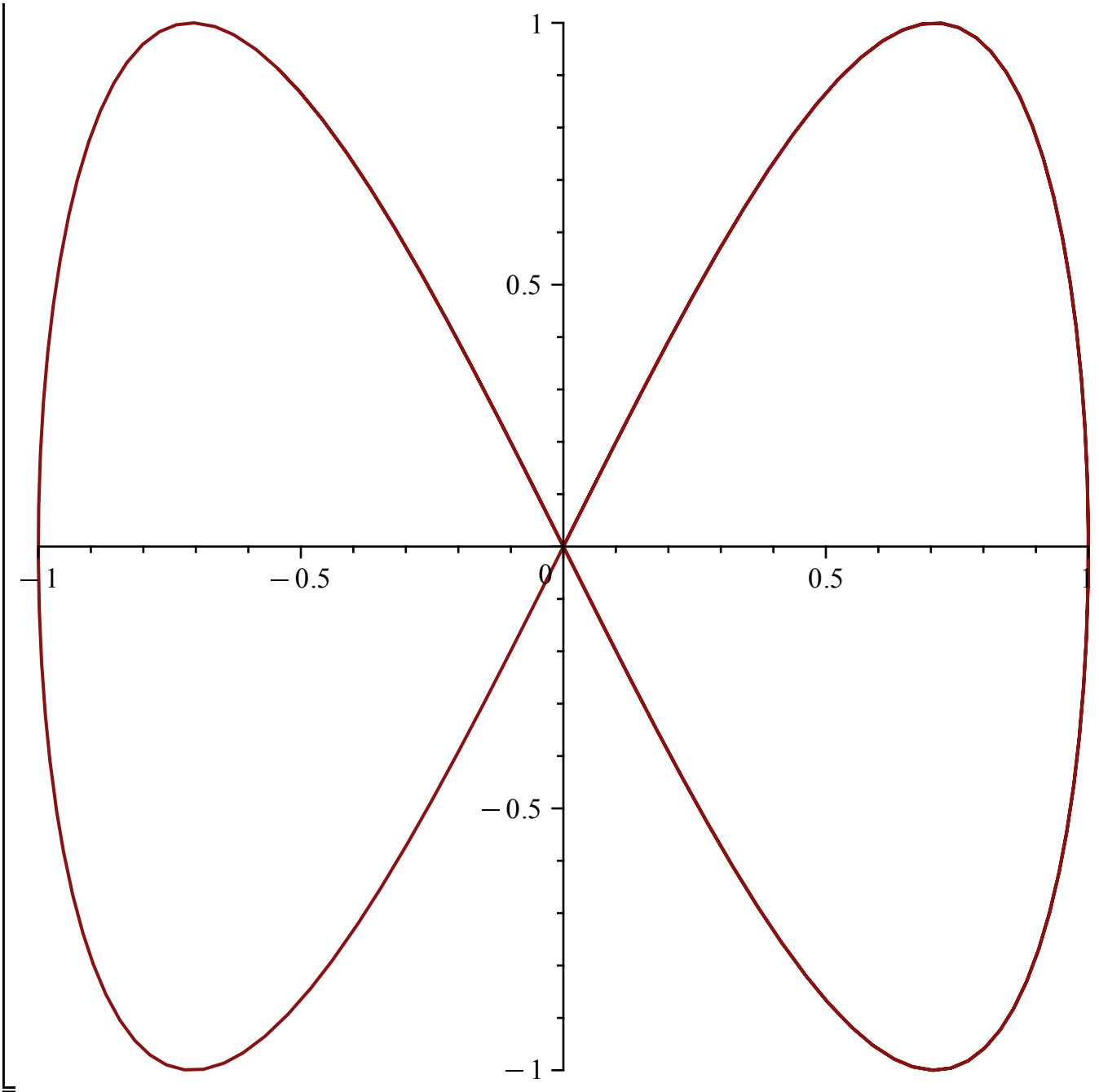
> $evalf(f(val))$

$$-6.596878591 \tag{16}$$

> $evalf(\mathrm{D}(f)\ (val))$

$$-2.187762472 \tag{17}$$

> $plot([\sin(t), \sin(2t), t = 0..10])$




```
> diff(sin(t), t)
```

$$\cos(t) \tag{18}$$

```
> with(LinearAlgebra) : with(VectorCalculus)
```

[&x, `*`, `+`, `-`, `.`, <,>, <|>, About, AddCoordinates, ArcLength, BasisFormat, Binormal, ConvertVector, CrossProduct, Curl, Curvature, D, Del, DirectionalDiff, Divergence, DotProduct, Flux, GetCoordinateParameters, GetCoordinates, GetNames, GetPVDescription, GetRootPoint, GetSpace, Gradient, Hessian, IsPositionVector, IsRootedVector, IsVectorField, Jacobian, Laplacian, LineInt, MapToBasis, ∇, Norm, Normalize, PathInt, PlotPositionVector, PlotVector, PositionVector, PrincipalNormal, RadiusOfCurvature, RootedVector, ScalarPotential, SetCoordinateParameters, SetCoordinates, SpaceCurve, SurfaceInt, **(19)**

TNBFrame, TangentLine, TangentPlane, TangentVector, Torsion, Vector, VectorField, VectorPotential, VectorSpace, Wronskian, diff, eval, evalVF, int, limit, series]

> $A := Matrix([[-7, 0], [1, 7]])$

$$A := \begin{bmatrix} -7 & 0 \\ 1 & 7 \end{bmatrix} \quad (20)$$

> $Determinant(A)$

$$-49 \quad (21)$$

> $Eigenvalues(A)$

$$\begin{bmatrix} 7 \\ -7 \end{bmatrix} \quad (22)$$

> $MatrixExponential(t \cdot A)$

$$\begin{bmatrix} e^{-7t} & 0 \\ \frac{e^{7t}}{14} - \frac{e^{-7t}}{14} & e^{7t} \end{bmatrix} \quad (23)$$

> $eq1 := x - 17 \cdot y + 3 \cdot y\hat{}2 - 2 \cdot x \cdot y = 0$

$$eq1 := -2xy + 3y^2 + x - 17y = 0 \quad (24)$$

> $eq2 := 17 \cdot x + y = 0$

$$eq2 := 17x + y = 0 \quad (25)$$

> $solve(\{eq1, eq2\}, \{x, y\})$

$$\{x = 0, y = 0\}, \left\{x = -\frac{290}{901}, y = \frac{290}{53}\right\} \quad (26)$$

> $f1 := (x, y) \to x - 17 \cdot y + 3 \cdot y\hat{}2 - 2 \cdot x \cdot y$

$$f1 := (x, y) \mapsto x + (-17 \cdot y) + 3 \cdot y^2 + (-2 \cdot x \cdot y) \quad (27)$$

> $f2 := (x, y) \to 17 \cdot x + y$

$$f2 := (x, y) \mapsto 17 \cdot x + y \quad (28)$$

> $Jm := Jacobian([f1(x, y), f2(x, y)], [x, y])$

$$Jm := \begin{bmatrix} -2y + 1 & -2x + 6y - 17 \\ 17 & 1 \end{bmatrix} \quad (29)$$

> $A := subs([x = 0, y = 0], Jm)$

$$A := \begin{bmatrix} 1 & -17 \\ 17 & 1 \end{bmatrix} \quad (30)$$

> $Eigenvalues(A)$

$$\begin{bmatrix} 1 + 17\,I \\ 1 - 17\,I \end{bmatrix} \quad (31)$$

> $eq1 := 0.002 \cdot x \cdot (100 - x) = 0$

$$eq1 := 0.002\,x\,(100 - x) = 0 \quad (32)$$

```
> solve(eq1, x)
```

0., 100. **(33)**

```
>
```