```
> restart : eq := diff(u(x), x$2) + 5·diff(u(x), x) − 7·u(x) = 5 · cos(x) − 7
```

$$eq := \frac{d^2}{dx^2} u(x) + 5 \frac{d}{dx} u(x) - 7\,u(x) = 5\cos(x) - 7 \tag{1}$$

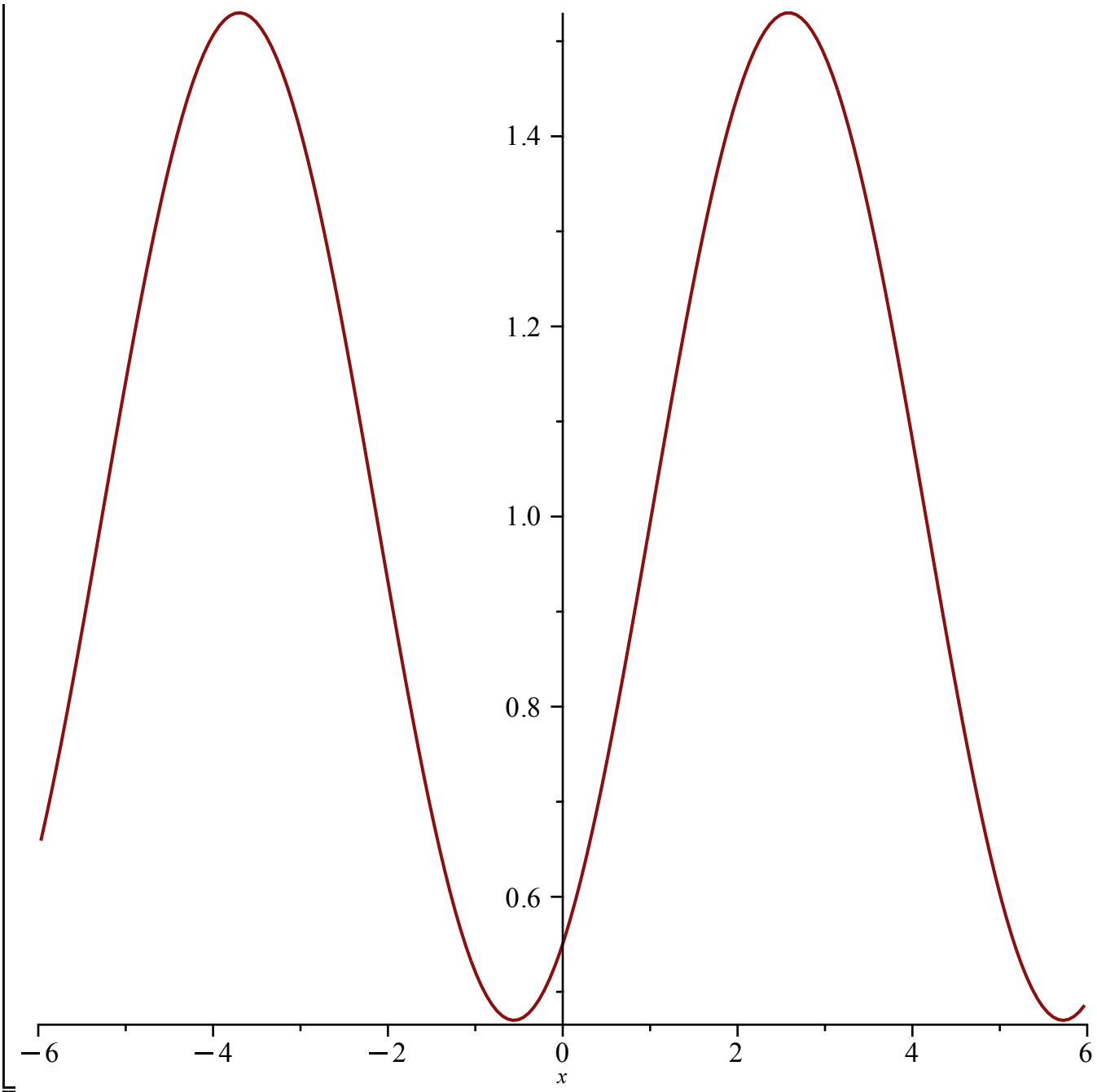
```
> sol := dsolve(eq, u(x))
```

$$sol := u(x) = e^{\frac{(-5+\sqrt{53})\,x}{2}} c_2 + e^{-\frac{(5+\sqrt{53})\,x}{2}} c_1 + \frac{25\sin(x)}{89} - \frac{40\cos(x)}{89} + 1 \tag{2}$$

```
> ss := subs( {c_1 = 0, c_2 = 0}, sol)
```

$$ss := u(x) = \frac{25\sin(x)}{89} - \frac{40\cos(x)}{89} + 1 \tag{3}$$

```
> plot(rhs(ss), x = −6 ..6)
```



> $evalf\left(subs\left(x=\exp\left(\frac{1}{2}\right),rhs(ss)\right),3\right)$

$$1.32 \quad \textbf{(4)}$$

> $evalf\left(subs\left(x=\exp\left(\frac{1}{2}\right),diff(rhs(ss),x)\right),3\right)$

$$0.426 \quad \textbf{(5)}$$

> $with(linalg):with(Student[LinearAlgebra]):with(LinearAlgebra):$

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

(6)

$$A := \begin{bmatrix} -7 & 0 \\ 1 & 7 \end{bmatrix} \tag{6}$$

> $d := det(A)$

$$d := -49 \tag{7}$$

> $eig := Eigenvalues(A)$

$$eig := \begin{bmatrix} 7 \\ -7 \end{bmatrix} \tag{8}$$

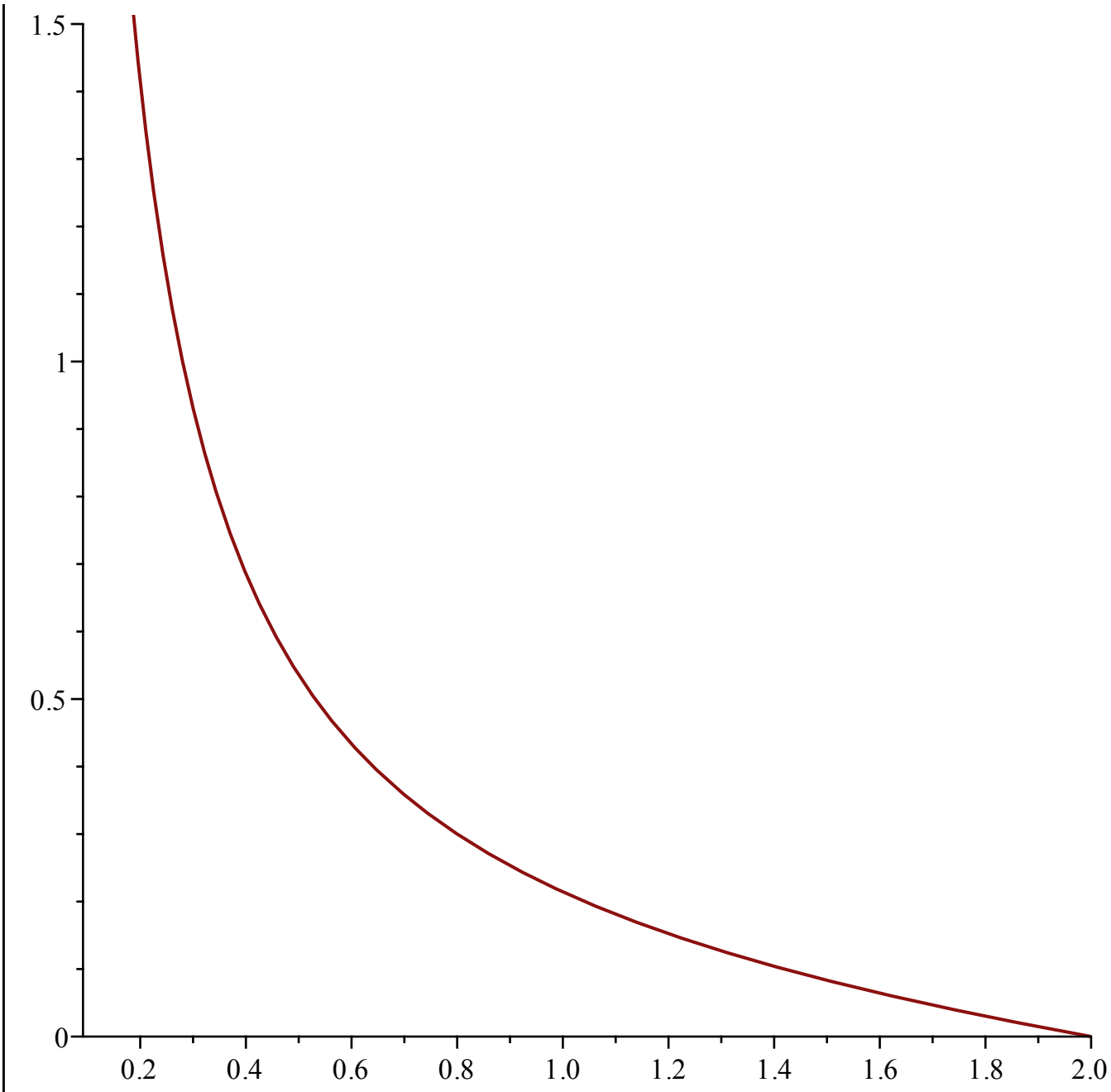
> $mexp := MatrixExponential(t \cdot A)$

$$mexp := \begin{bmatrix} e^{-7t} & 0 \\ \frac{e^{7t}}{14} - \frac{e^{-7t}}{14} & e^{7t} \end{bmatrix} \tag{9}$$

> $sol := dsolve(\{diff(x(t), t) = -7 \cdot x(t), diff(y(t), t) = x(t) + 7 \cdot y(t), x(0) = 2, y(0) = 0\}, \{x(t), y(t)\})$

$$sol := \left\{x(t) = 2\, e^{-7t}, y(t) = -\frac{e^{-7t}}{7} + \frac{e^{7t}}{7}\right\} \tag{10}$$

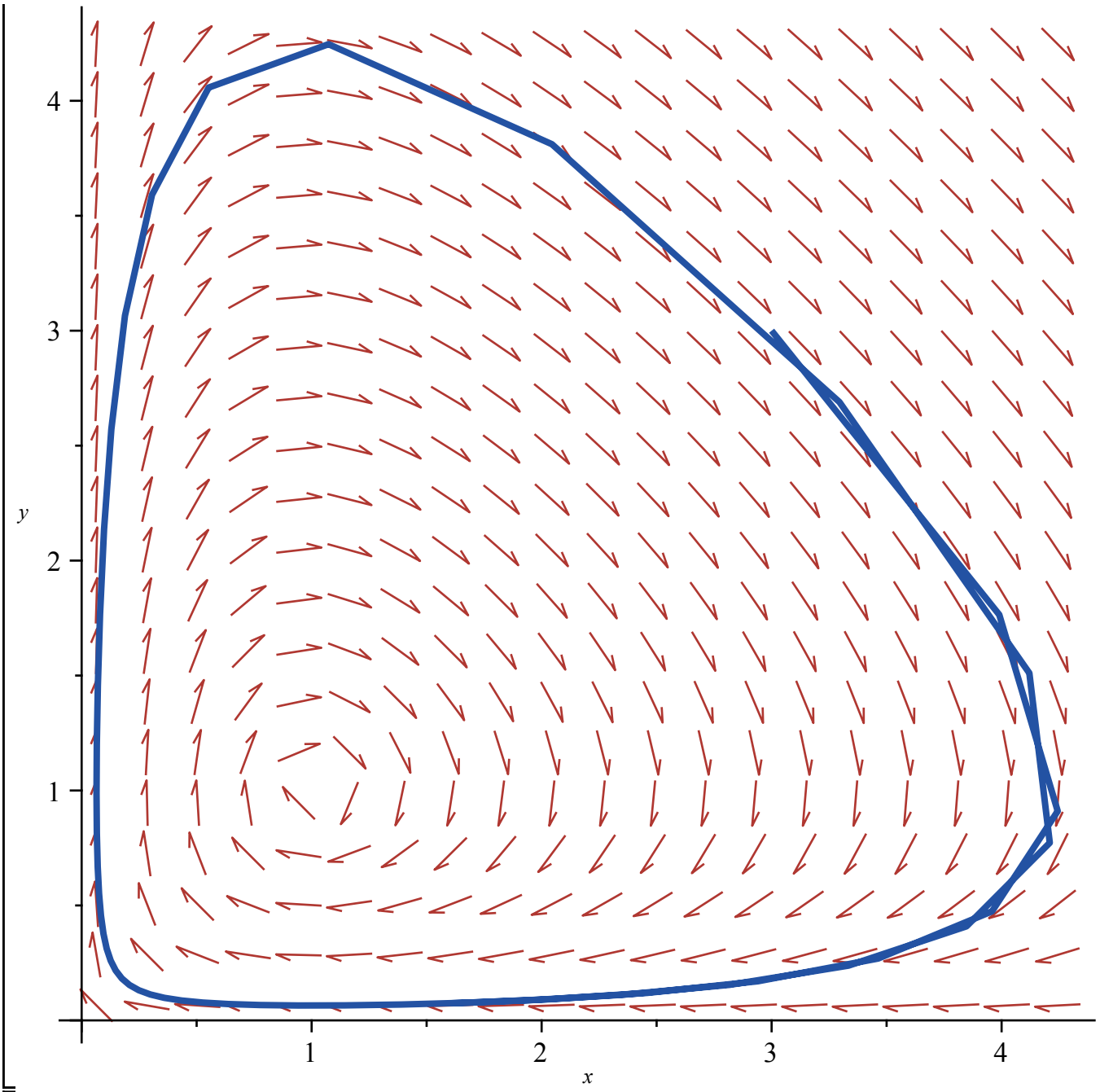
> $plot([rhs(sol[1]), rhs(sol[2])\ , t = 0..2])$



> $sol := dsolve(\{diff(x(t),t) = -7\cdot x(t), diff(y(t),t) = x(t) + 7\cdot y(t), x(0) = 2, y(0) = 0\}, \{x(t), y(t)\})$

$$sol := \left\{x(t) = 2\,e^{-7t}, y(t) = -\frac{e^{-7t}}{7} + \frac{e^{7t}}{7}\right\} \quad \textbf{(11)}$$

> $with(DEtools) : with(plots) : DEplot([diff(x(t),t) = -x(t) + x(t)\cdot y(t), diff(y(t),t) = y(t) - x(t)\cdot y(t)], [x(t), y(t)], t = 0..10, [[x(0) = 3, y(0) = 3]])$



> $equilibrium := solve(\{-x + x \cdot y = 0, y - x \cdot y = 0\}, \{x, y\})$

$$equilibrium := \{x = 0, y = 0\}, \{x = 1, y = 1\} \quad \textbf{(12)}$$

> $solve\left(\frac{(x^2 + 5)}{2 \cdot x} = x, x\right)$

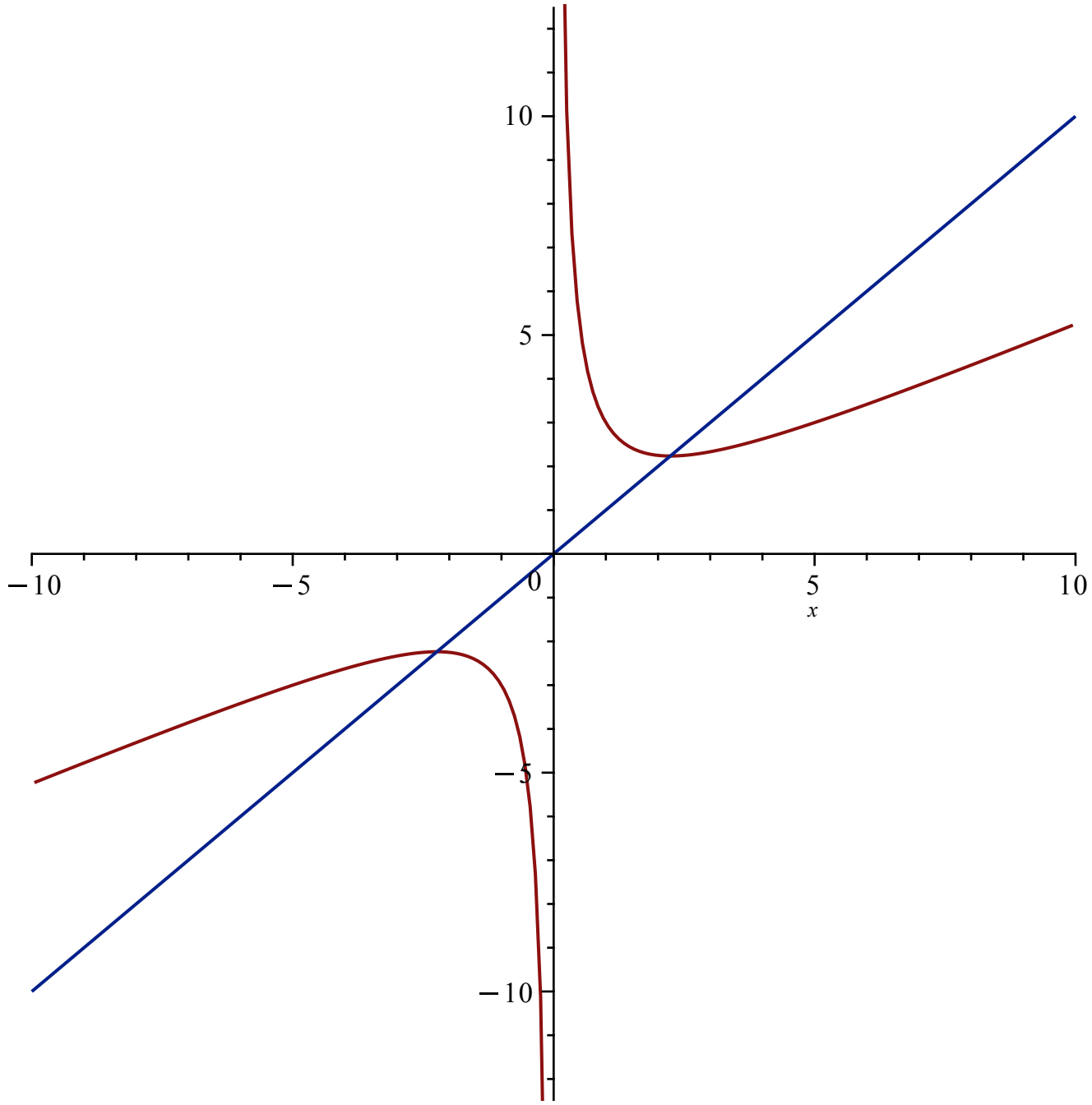
$$-\sqrt{5}, \sqrt{5} \quad \textbf{(13)}$$

> $bisectrix := x \to x; f := x \to \frac{(x^2 + 5)}{2 \cdot x}$

$$bisectrix := x \mapsto x$$

$$f := x \mapsto \frac{x^2 + 5}{2 \cdot x} \quad \textbf{(14)}$$

```
> plot( [f(x), bisectrix(x)], x = -10..10)
```




```
> x0 := 2 :for k from 1 to 20 do: x0 := f(x0) : psi(x0) := x0 : print(evalf(x0) );od:
```

2.250000000
2.236111111
2.236067978
2.236067977
2.236067977
2.236067977
2.236067977
2.236067977

2.236067977
2.236067977
2.236067977
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2.236067977
2.236067977
2.236067977
2.236067977
2.236067977
2.236067977
2.236067977 **(15)**

> $x0 := 10$:**for** k **from** 1 **to** 20 **do**: $x0 := f(x0)$: psi$(x0) := x0$: $print(evalf(x0))$;**od**:

5.250000000
3.101190476
2.356737273
2.239157223
2.236070109
2.236067978
2.236067977
2.236067977
2.236067977
2.236067977
2.236067977
2.236067977
2.236067977
2.236067977
2.236067977
2.236067977
2.236067977
2.236067977
2.236067977
2.236067977 **(16)**

> $x0 := -3$:**for** k **from** 1 **to** 20 **do**: $x0 := f(x0)$: psi$(x0) := x0$: $print(evalf(x0))$;**od**:

−2.333333333
−2.238095238
−2.236068896
−2.236067977
−2.236067977

$$
\begin{aligned}
&-2.236067977\\
&-2.236067977\\
&-2.236067977\\
&-2.236067977\\
&-2.236067977\\
&-2.236067977\\
&-2.236067977\\
&-2.236067977\\
&-2.236067977\\
&-2.236067977\\
&-2.236067977\\
&-2.236067977\\
&-2.236067977\\
&-2.236067977\\
&-2.236067977
\end{aligned}
\tag{17}
$$

>