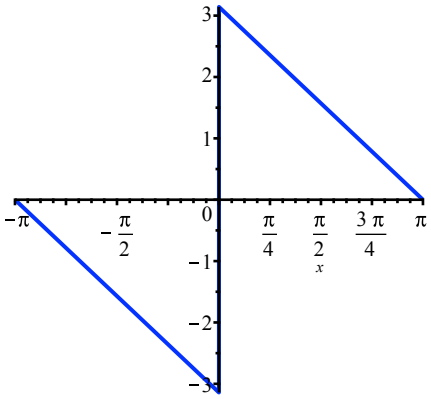
```
> restart:
  with(plots):
  nmax := 100:
> Skalarprodukt := proc(f,g)
  int(f*g,x=-Pi..Pi) / Pi
  end proc:
> A := Matrix([seq([seq(Skalarprodukt(sin(j*x),sin(k*x)),j=1..10)],k=
  1..10)]);
```

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

```
> # f := x;
  # f := signum(x);
  f := signum(x)*(Pi-abs(x));
  plot(f,x=-Pi..Pi,color=blue);
```

$$f := \mathrm{signum}(x)\ (\pi - |x|)$$




```
> c := [seq(simplify(Skalarprodukt(f,sin(k*x))),k=1..nmax)];
```

$$c := \left[2, 1, \frac{2}{3}, \frac{1}{2}, \frac{2}{5}, \frac{1}{3}, \frac{2}{7}, \frac{1}{4}, \frac{2}{9}, \frac{1}{5}, \frac{2}{11}, \frac{1}{6}, \frac{2}{13}, \frac{1}{7}, \frac{2}{15}, \frac{1}{8}, \frac{2}{17}, \frac{1}{9}, \frac{2}{19}, \frac{1}{10},\right. \quad \textbf{(2)}$$

$$\frac{2}{21}, \frac{1}{11}, \frac{2}{23}, \frac{1}{12}, \frac{2}{25}, \frac{1}{13}, \frac{2}{27}, \frac{1}{14}, \frac{2}{29}, \frac{1}{15}, \frac{2}{31}, \frac{1}{16}, \frac{2}{33}, \frac{1}{17}, \frac{2}{35}, \frac{1}{18}, \frac{2}{37},$$

$$\frac{1}{19}, \frac{2}{39}, \frac{1}{20}, \frac{2}{41}, \frac{1}{21}, \frac{2}{43}, \frac{1}{22}, \frac{2}{45}, \frac{1}{23}, \frac{2}{47}, \frac{1}{24}, \frac{2}{49}, \frac{1}{25}, \frac{2}{51}, \frac{1}{26}, \frac{2}{53}, \frac{1}{27},$$

$$\left.\frac{2}{55}, \frac{1}{28}, \frac{2}{57}, \frac{1}{29}, \frac{2}{59}, \frac{1}{30}, \frac{2}{61}, \frac{1}{31}, \frac{2}{63}, \frac{1}{32}, \frac{2}{65}, \frac{1}{33}, \frac{2}{67}, \frac{1}{34}, \frac{2}{69}, \frac{1}{35}, \frac{2}{71},\right.$$

$$\frac{1}{36}, \frac{2}{73}, \frac{1}{37}, \frac{2}{75}, \frac{1}{38}, \frac{2}{77}, \frac{1}{39}, \frac{2}{79}, \frac{1}{40}, \frac{2}{81}, \frac{1}{41}, \frac{2}{83}, \frac{1}{42}, \frac{2}{85}, \frac{1}{43}, \frac{2}{87}, \frac{1}{44},$$
$$\frac{2}{89}, \frac{1}{45}, \frac{2}{91}, \frac{1}{46}, \frac{2}{93}, \frac{1}{47}, \frac{2}{95}, \frac{1}{48}, \frac{2}{97}, \frac{1}{49}, \frac{2}{99}, \frac{1}{50}\Big]$$

```
> for n from 0 to nmax do
  g[n] := add(c[k]*sin(k*x),k=1..n)
  od:
  g[10];
```

$$2\sin(x) + \sin(2x) + \frac{2\sin(3x)}{3} + \frac{\sin(4x)}{2} + \frac{2\sin(5x)}{5} + \frac{\sin(6x)}{3} + \frac{2\sin(7x)}{7} + \frac{\sin(8x)}{4} + \frac{2\sin(9x)}{9} + \frac{\sin(10x)}{5} \quad \textbf{(3)}$$

```
> display([seq(plot([f,g[n]],x=-Pi..Pi,color=[blue,red]),n=1..nmax)],
  insequence);
```