

Izražava signalov s temeljnimi funkcijami

Trigonometrične temeljne funkcije

Definicija prvih nekaj funkcij

```
In[152]:= T0[t_] := 1;  
T1[t_] := Sin[ω * t];  
T2[t_] := Cos[ω * t];  
T3[t_] := Sin[2 * ω * t];  
T4[t_] := Cos[2 * ω * t];  
T5[t_] := Sin[3 * ω * t];  
T6[t_] := Cos[4 * ω * t];
```

```
In[88]:= ω :=  $\frac{2 * \pi}{T}$ ;
```

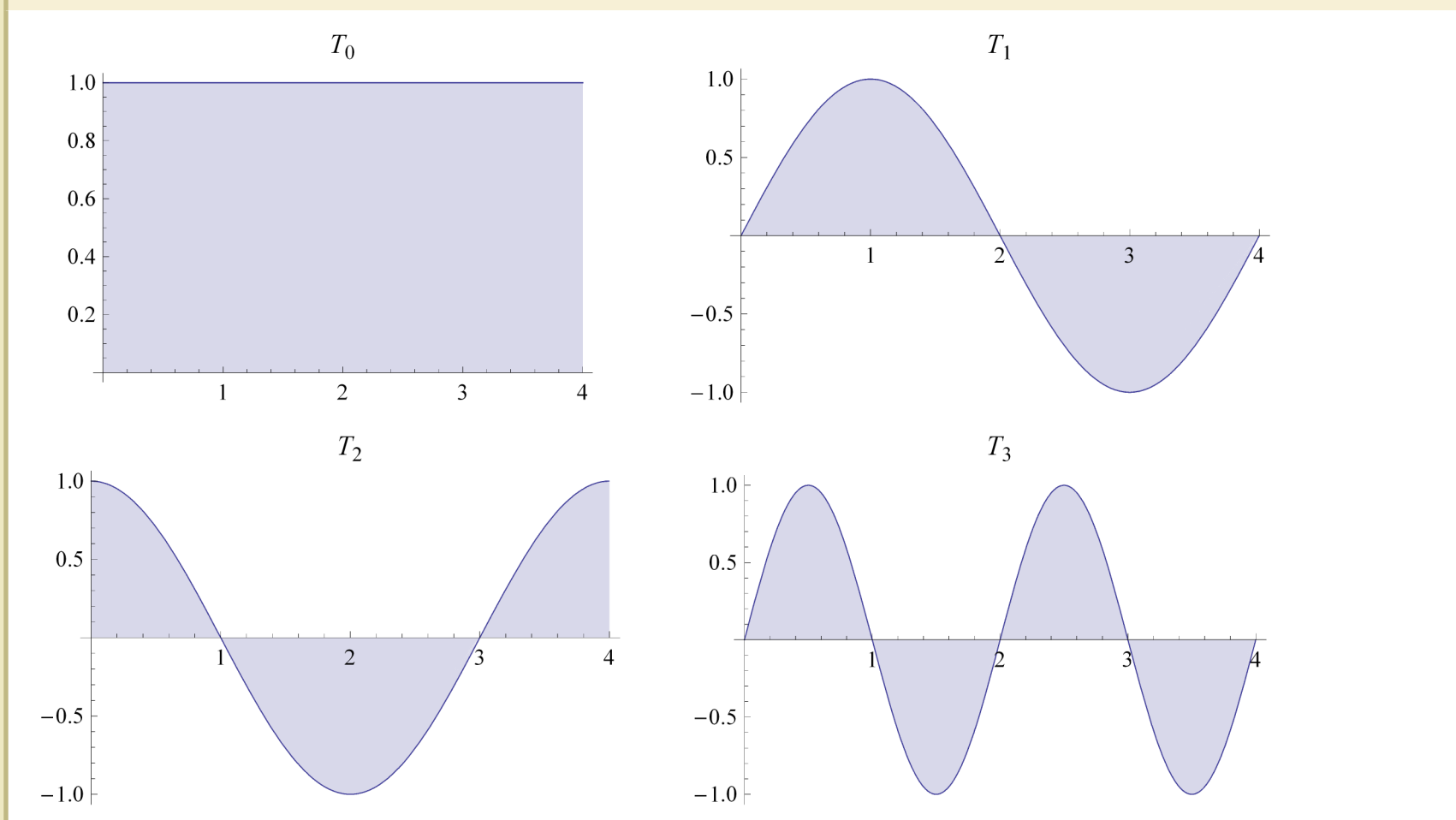
Koeficienti:

```
In[112]:= K0 := T;  
K1 := T / 2;  
K2 := T / 2;  
K3 := T / 2;  
K4 := T / 2;
```

Izris funkcij:

```
In[136]:= T = 4;
gw0 = Plot[T0[t], {t, 0, T}, PlotRange → All, PlotLabel → "T0", Filling → Axis];
gw1 = Plot[T1[t], {t, 0, T}, PlotRange → All, PlotLabel → "T1", Filling → Axis];
gw2 = Plot[T2[t], {t, 0, T}, PlotRange → All, PlotLabel → "T2", Filling → Axis];
gw3 = Plot[T3[t], {t, 0, T}, PlotRange → All, PlotLabel → "T3", Filling → Axis];
GraphicsGrid[{{gw0, gw1}, {gw2, gw3}}]
```

Out[141]=



Aproksimacija signala (naloga 2)

Naloga:

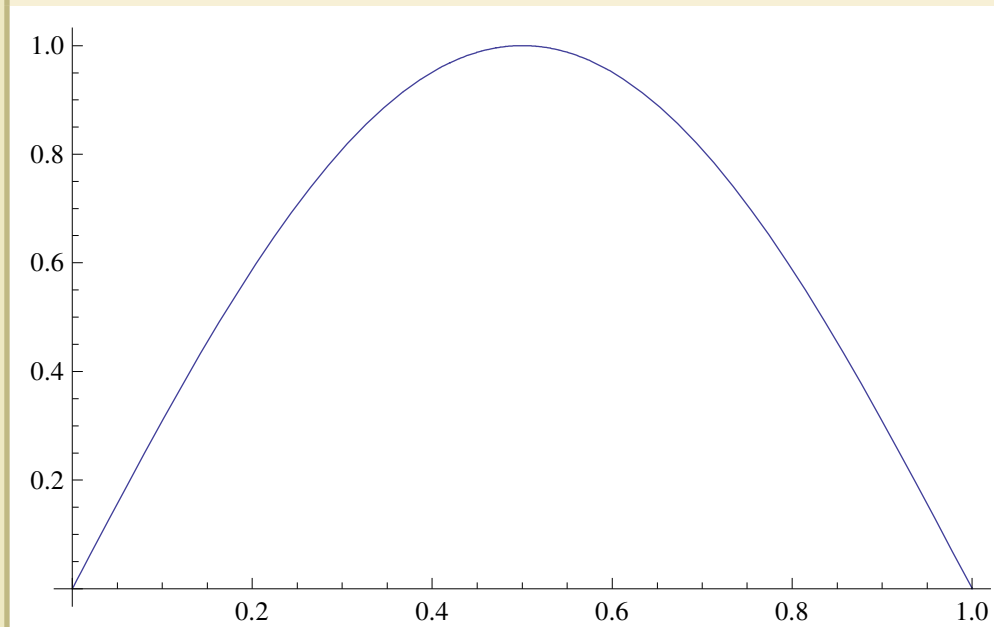
Signal $x(t) = \sin[\pi t]$ na intervalu $[0,1]$ izrazite s približkom prvih štirih trigonometričnih temeljnih funkcij.

Določite še razliko v napako aproksimacije, če aproksimiramo samo s tremi trig. t.f. in skicirajte približek.

```
In[142]:= x[t_] := Sin[π * t];
```

```
In[143]:= Plot[x[t], {t, 0, 1}, PlotRange → All]
```

Out[143]=



▫ Rešitev:

In[151]:= $T = 1; \omega = 2 * \pi;$

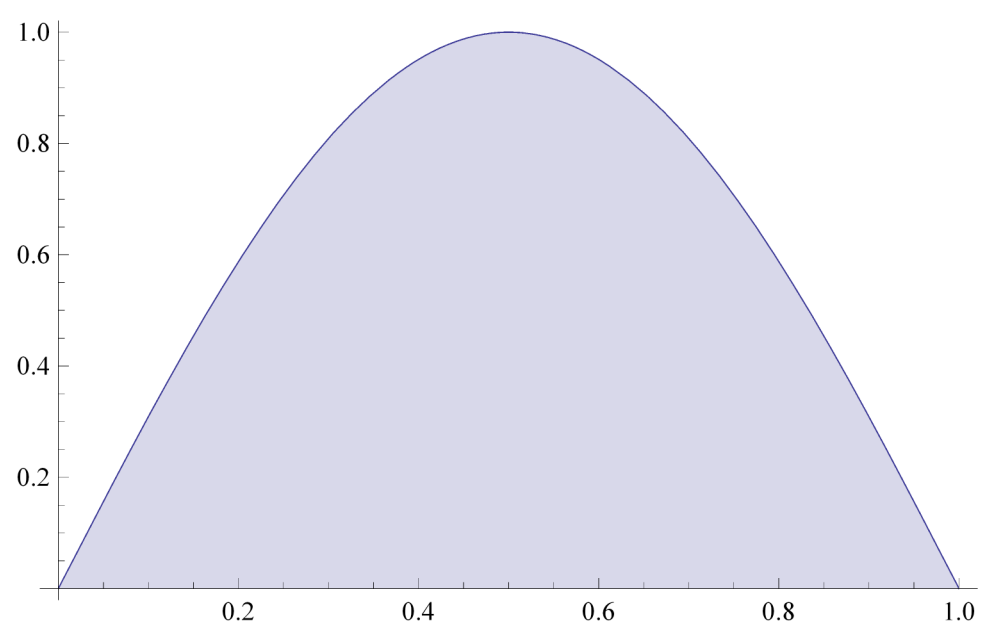
In[145]:= $K_0 := 1;$
 $K_1 := 1 / 2;$
 $K_2 := 1 / 2;$
 $K_3 := 1 / 2;$

In[149]:= $C_0 = \frac{1}{1} * \int_0^1 \text{Sin}[\pi * t] * 1 dt$

Out[149]= $\frac{2}{\pi}$

In[159]:= $\text{Plot}[\{x[t] * T_0[t]\}, \{t, 0, 1\}, \text{Filling} \rightarrow \text{Axis}]$

Out[159]=

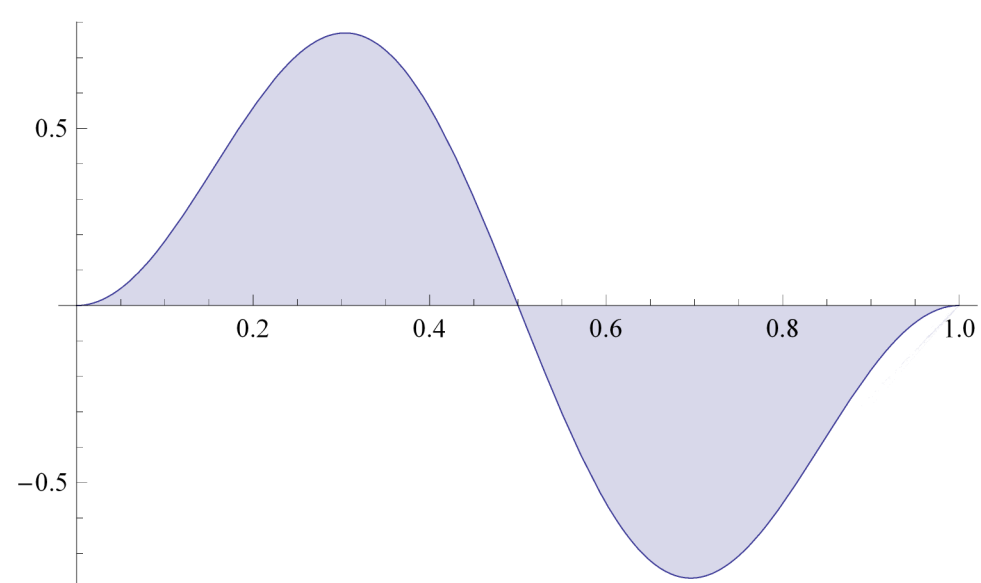


In[160]:= $C_1 = \frac{1}{\frac{1}{2}} * \int_0^1 \text{Sin}[\pi * t] * \text{Sin}[2 * \pi * t] dt$

Out[160]= 0

In[161]:= $\text{Plot}[\{x[t] * T_1[t]\}, \{t, 0, 1\}, \text{Filling} \rightarrow \text{Axis}]$

Out[161]=



$$\text{In[162]:= } C_2 = \frac{1}{\frac{1}{2}} * \int_0^1 \text{Sin}[\pi * t] * \text{Cos}[2 * \pi * t] dt$$

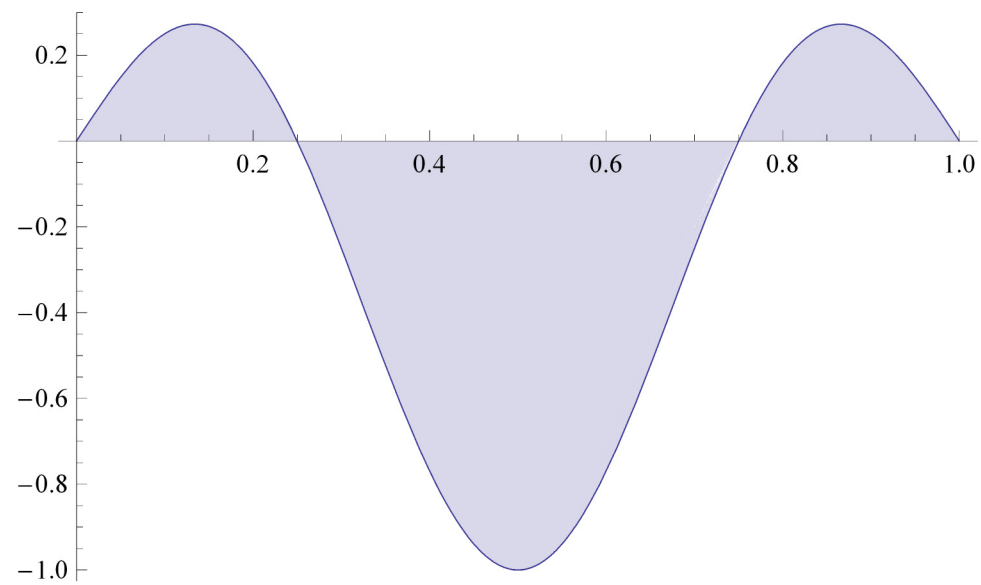
$$\text{Out[162]= } -\frac{4}{3\pi}$$

Pomoč pri izračunu koeficienta C_2 :

$$\text{Sin}[\alpha] * \text{Cos}[\beta] = \frac{1}{2} * \text{Sin}[\alpha + \beta] + \text{Sin}[\alpha - \beta]$$

$$\text{In[163]:= } \text{Plot}[\{x[t] * T_2[t]\}, \{t, 0, 1\}, \text{Filling} \rightarrow \text{Axis}]$$

Out[163]=

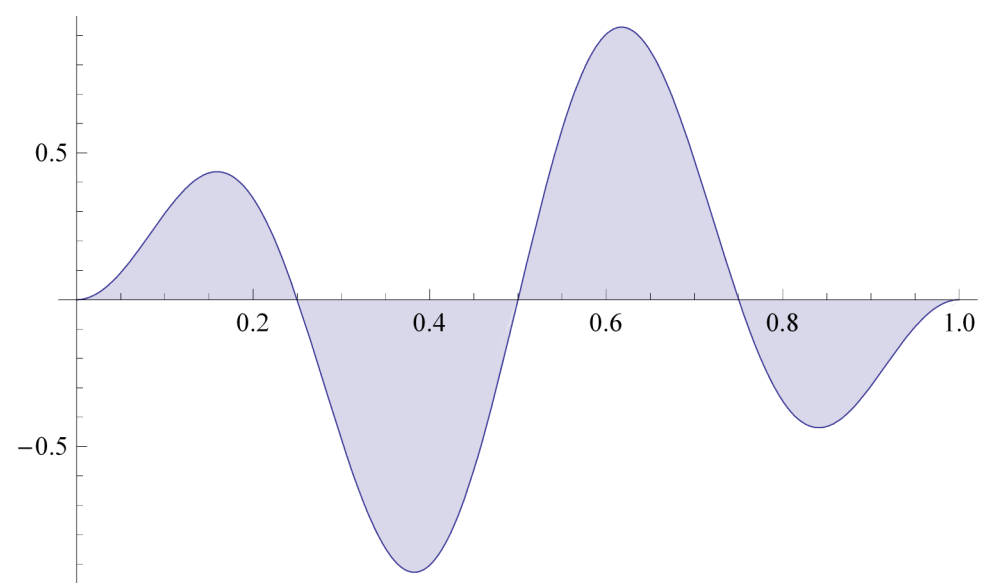


$$\text{In[164]:= } C_3 = \frac{1}{\frac{1}{2}} * \int_0^1 \text{Sin}[\pi * t] * \text{Sin}[3 * \pi * t] dt$$

Out[164]= 0

$$\text{In[165]:= } \text{Plot}[\{x[t] * T_3[t]\}, \{t, 0, 1\}, \text{Filling} \rightarrow \text{Axis}]$$

Out[165]=

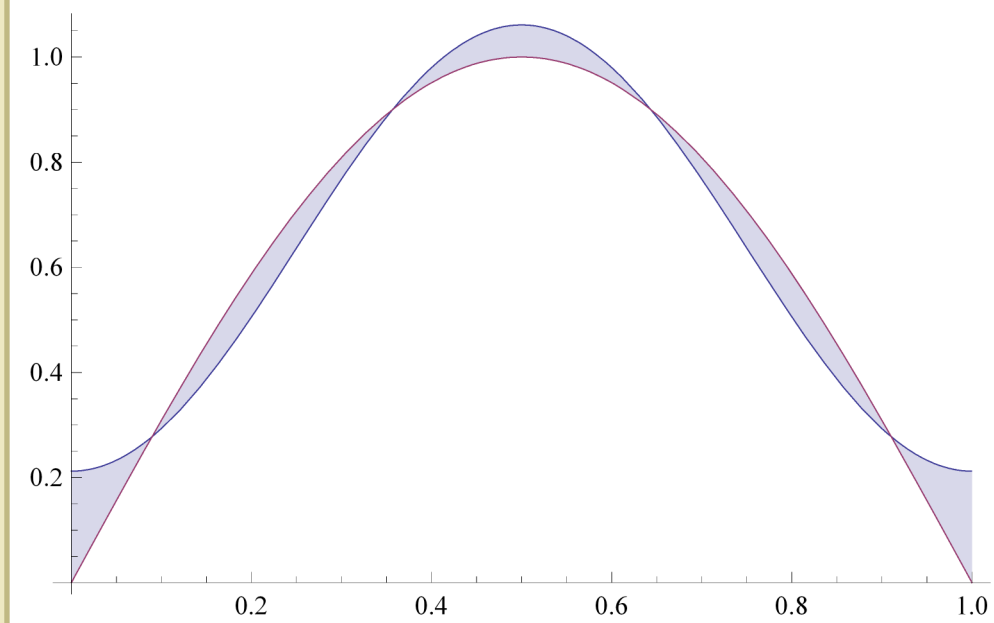


□ Izris aproksimiranega signala:

In[166]:=

```
Plot[{C0 T0[t] + C1 T1[t] + C2 T2[t] + C3 T3[t], x[t]}, {t, 0, 1}, Filling -> {1 -> {2}}]
```

Out[166]=



□ Izračun razlike napake, če aproksimiramo s prvimi 4-imi trig .t.f. ali pa samo s 3-mi trig.t.f.

$$\Delta\epsilon = \epsilon_4 - \epsilon_3 = \frac{1}{t_2 - t_1} * K_3 * C_3 * C_3;$$

V našem primeru:

In[167]:=

$$\Delta\epsilon = \frac{1}{1} * \frac{1}{2} * 0 * 0$$

Out[167]=

0