<p style="text-align:center">Kirill Zakharov</p>

Trigonometric interpolation

```
trigInter[fun_, n_, L_, point_] := Module[{n2 = 2 (n + 1), xm, ym, a0, an, ak, bk},
  xm = Table[L/n2 m, {m, 1, n2}];
  ym = fun /@ xm // N;
  a0 = 1/n2 Sum[ym[[i]], {i, 1, n2}];
  ak = Table[2/n2 Sum[ym[[i]] Cos[k 2 Pi/n2 i], {i, 1, n2}], {k, 1, n - 1}];
  bk = Table[2/n2 Sum[ym[[i]] Sin[k 2 Pi/n2 i], {i, 1, n2}], {k, 1, n - 1}];
  an = 1/n2 Sum[(-1)^i ym[[i]], {i, 1, n2}];
  a0 + Sum[ak[[k]] Cos[k * 2 Pi/L * point] + bk[[k]] Sin[k * 2 Pi/L * point], {k, 1, n - 1}] + an]
```

```
visualization[fun_, n_, L_] :=
 Show[{Plot[fun[k], {k, -2 Pi, 2 Pi}, PlotLegends → {"Initial function"}],
   Plot[trigInter[fun, n, L, x] /. x → k, {k, -Pi, Pi},
    PlotStyle → Red, PlotLegends → {"Interpolant"}]}, PlotRange → Full]
```
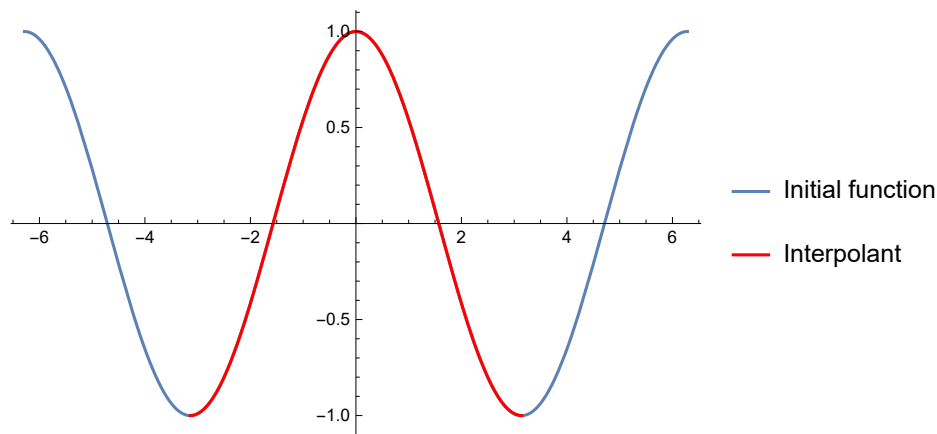
```
trigInter[Cos, 6, 2 Pi, x]
```

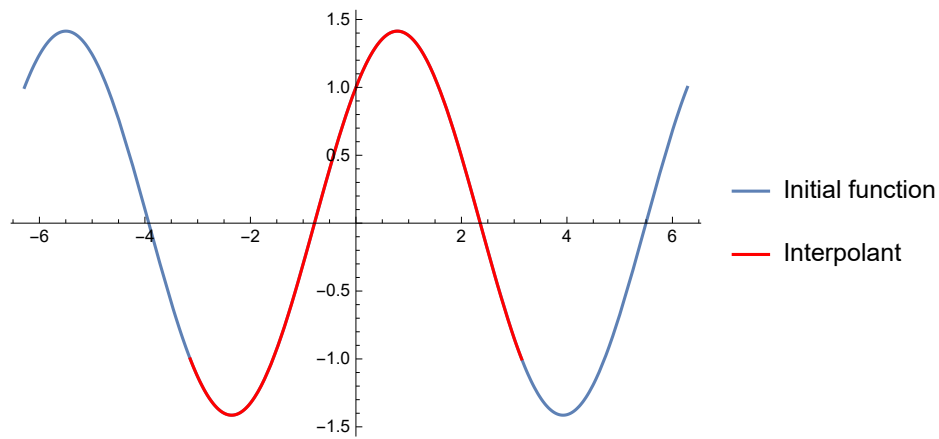$7.93016 \times 10^{-18} + 1. \, Cos[x] + 7.93016 \times 10^{-18} \, Sin[x] + 3.17207 \times 10^{-17} \, Sin[2 \, x]$

Test

```
visualization[Cos, 4, 2 Pi]
```



```
fun[x_] := Cos[x] + Sin[x]
```

visualization[fun, 3, 2 Pi]

fun1[x_] := (Sin[3 x])²

visualization[fun1, 3, Pi / 3]