

## 1.1.2 Лабораторная работа №5

### Тригонометрическая интерполяция (нечетная функция)

$$Q_n = \sum_{k=1}^{n+1} b_k \sin \frac{2\pi k}{L} x,$$

$$b_k = \frac{2}{n+1} \sum_{m=0}^n f_m \sin \frac{2\pi k}{L} x_m, \quad k = 1, 2, \dots, n,$$

$$b_{n+1} = \frac{1}{n+1} \sum_{m=0}^n f_m (-1)^m.$$

$n$  - степень тригонометрического полинома

$p$  - точка, от которой считается полином

```
In[452]:= interpolationOdd[fun_, n_, point_] :=
Module[{n2 = 2 (n + 1), L = 2 Pi, xm, ym, bnk, bk, res, p = point},
  xm = Table[(-L * m) / n2 + L / (2 n2), {m, 1, n2}];
  ym = N[fun /@ xm];
  bk = Table[ $\frac{2}{n+1} \sum_{m=1}^{n+1} (ym[[m]] * Sin[\frac{2 \pi * k * xm[[m]]}{L}])$ ], {k, 1, n}];
  bnk =  $\frac{1}{n+1} \sum_{m=1}^n ym[[m]] * (-1)^m$ ;
  res = (bnk +  $\sum_{k=1}^n bk[[k]] * Sin[k * \frac{2 \pi}{L} * p]$ ); res
]
```

#### Пример 1

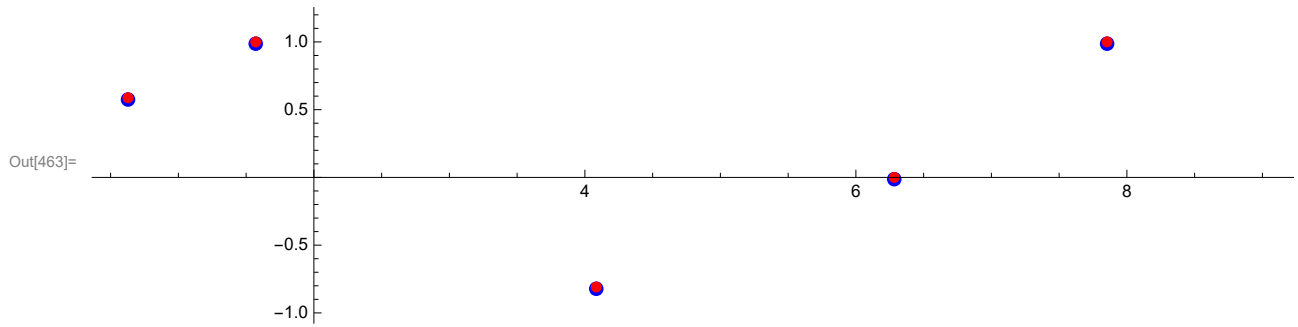
```
In[415]:= points1 = {2 Pi, Pi / 2, 3.8 Pi, 4.3 Pi, 2.5 Pi, 0.2 Pi, 1.3 Pi};

In[490]:= interpolationOdd[Sin, 5, x]
Out[490]= 0.0431365 + 1. Sin[x] + 9.25186 × 10-18 Sin[2 x] -
1.85037 × 10-17 Sin[3 x] + 1.85037 × 10-17 Sin[4 x] - 5.55112 × 10-17 Sin[5 x]

In[489]:= interpolationOdd[Sin, 5, #] & /@ points1
Out[489]= {0.0431365, 1.04314, -0.544649, 0.852154, 1.04314, 0.630922, -0.76588}

In[461]:= new = interpolationOdd[Sin, 10, #] & /@ points1;
pointf = Sin /@ points1; l1 = {points1, new} // Transpose;
l2 = {points1, pointf} // Transpose;
```

```
In[463]:= Show[Graphics[{Blue, PointSize[0.008],
  Point /@ l1, Red, PointSize[0.006], Point /@ l2}, Axes -> True]]
```



```
In[460]:= Show[Plot[interpolationOdd[Sin, 4, k], {k, 0, 6}, PlotStyle -> Red,
  PlotLegends -> {"Interpolation"}], Plot[Sin[k], {k, 0, 6}, PlotLegends -> {"Sin"}]]
```

