In[239]:=

```
(*----------
* 1 задача
*----------*)
ApproxIntegral[M_, a_, b_, f_] := With[
{
h = (b - a) / (2 M),
xk = Function[k, a + k * (b - a) / (2 M)]
},
(h / 3) (f[a] + f[b]) +
(2 h / 3) Sum[f[xk[2 k]], {k, 1, M - 1}] +
(4 h / 3) Sum[f[xk[2 k - 1]], {k, 1, M}]
]



Integrand[x_] := 1 / ((1 + 2 x ^ 2) ^ 5)
m15 := N[ApproxIntegral[15, -1, 1, Integrand], {Infinity, 20}]
m50 := N[ApproxIntegral[50, -1, 1, Integrand], {Infinity, 20}]
correct := N[Integrate[Integrand[x], {x, -1, 1}], {Infinity, 20}]

Print["1 задача)"]
Print["При M=15:        ", m15]
Print["Разлика с точен: ", N[correct - m15, {Infinity, 20}]]
Print["При M=50:        ", m50]
Print["Разлика с точен: ", N[correct - m50, {Infinity, 20}]]
Print["Точна стойност:  ", correct]

(*----------
* 2 задача
*----------*)

(* Намиране Pn *)
Pncoeff[xs_, f_] := With[
{
k = Length[xs],
x0 = First[xs],
xk = Last[xs]
},
Piecewise[{
{
f[xk],
```

```
k == 1
},
{
(Pncoeff[Drop[xs, 1], f] - Pncoeff[Drop[xs, -1], f]) / (xk - x0),
x0 ≠ xk
},
{
(D[f[y], {y, k - 1}] /. y → x0) / ((k - 1)!),
x0 == xk
}}]
]

Pn[f_, xsWithDup_] := With[
{ xs = xsWithDup },
Function[x, Sum[
Pncoeff[Take[xs, i], f] *
Product[x - xs[[j]], {j, 1, i - 1}],
{i, 1, Length[xs]}
]]
]

f[x_] := Piecewise[{
{Cos[3 x], x ≤ Pi},
{x - Pi - 1, x > Pi}
}]
values := {9 Pi / 10, 9 Pi / 10, 9 Pi / 10, 10 Pi / 11, 10 Pi / 11, 11 Pi / 10}
newtonpolyn := Pn[f, values]

Print["2 задача)"]
Print["Полином: ", Simplify[newtonpolyn[x]]]
(*InterpolatingPolynomial[{{9Pi/10,f[9Pi/10]},{10Pi/11,f[10Pi/11]},{11Pi/10,f[11Pi/10]}},x]*)

(* Графика разлика *)
Print["Графика на разлика:"]
Plot[Abs[f[z] - newtonpolyn[z]], {z, -6.5, 12}]
```

```
1 задача)
При M=15:        0.60610951916436212587
Разлика с точен: 2.965873495437 × 10^-7
При M=50:        0.6061098132868333936
Разлика с точен: 2.4648782760 × 10^-9
```

Точна стойност: 0.6061098157517116696

2 задача)

Полином: $\frac{1}{7056\,\pi^5}\Big(353\,637\,900\,\sqrt{10-2\,\sqrt{5}}\;\pi^7 -$

$4860\,\pi^6\Big(10\,861\,150+10\,860\,850\,\sqrt{5}+387\,933\,\sqrt{10-2\,\sqrt{5}}\;x+22\,137\,192\,\text{Cos}\big[\frac{5\,\pi}{22}\big]\Big)+$

$6\,050\,000\,x^5\Big(-4+660\,177\,\sqrt{10-2\,\sqrt{5}}-2\,640\,704\,\text{Sin}\big[\frac{5\,\pi}{22}\big]\Big)-$

$500\,\pi^2\,x^3\Big(395\,212-70\,824\,823\,587\,\sqrt{10-2\,\sqrt{5}}+960\,498\,\sqrt{10-2\,\sqrt{5}}\;x^2+$

$154\,x\Big(4\,410\,079+4\,409\,937\,\sqrt{5}+9\,025\,632\,\text{Cos}\big[\frac{5\,\pi}{22}\big]\Big)+283\,298\,899\,136\,\text{Sin}\big[\frac{5\,\pi}{22}\big]\Big)+$

$55\,000\,\pi\,x^4\Big(22\,x\Big(59\,537+59\,535\,\sqrt{5}+121\,968\,\text{Cos}\big[\frac{5\,\pi}{22}\big]\Big)+$

$7\Big(284-48\,885\,039\,\sqrt{10-2\,\sqrt{5}}+195\,539\,872\,\text{Sin}\big[\frac{5\,\pi}{22}\big]\Big)\Big)+$

$50\,\pi^3\,x^2\Big(45\,318\,042\,\sqrt{10-2\,\sqrt{5}}\;x^2+2\,x\Big(6\,391\,498\,151+6\,391\,300\,545\,\sqrt{5}+13\,067\,651\,520\,\text{Cos}\big[\frac{5\,\pi}{22}\big]\Big)+$

$27\Big(132\,268-24\,638\,142\,123\,\sqrt{10-2\,\sqrt{5}}+98\,552\,436\,224\,\text{Sin}\big[\frac{5\,\pi}{22}\big]\Big)\Big)+$

$9\,\pi^5\Big(600\,\big(52\,167\,727+52\,166\,233\,\sqrt{5}\big)\,x+446\,120\,451\,\sqrt{10-2\,\sqrt{5}}\;x^2+63\,863\,786\,448\,x\,\text{Cos}\big[\frac{5\,\pi}{22}\big]+$

$8\Big(202\,500-40\,576\,930\,625\,\sqrt{10-2\,\sqrt{5}}+162\,307\,519\,902\,\text{Sin}\big[\frac{5\,\pi}{22}\big]\Big)\Big)-$

$270\,\pi^4\,x\Big(15\,811\,173\,\sqrt{10-2\,\sqrt{5}}\;x^2+x\Big(2\,224\,202\,447+2\,224\,136\,313\,\sqrt{5}+4\,542\,820\,128\,\text{Cos}\big[\frac{5\,\pi}{22}\big]\Big)-$

$900\Big(64\,186\,227\,\sqrt{10-2\,\sqrt{5}}-4\Big(83+64\,186\,144\,\text{Sin}\big[\frac{5\,\pi}{22}\big]\Big)\Big)\Big)\Big)\Big)$

Графика на разлика:

Out[258]=

