Zestaw 6

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3N

Metoda Romberga przyblizono calke $\int_0^\infty \mathrm{Sin}\left(\frac{1+\sqrt{x}}{1+x^2}\right) dx$.

```
In[1]:= f[x_] := Sin[(1 + Sqrt[x])/(1 + x Sqrt[2])] e^-x;

In[2]:= Romberg[a_, b_, prec_] := Module[{},
          reg[x_] := Module[{k},
            R[[x+1,1]] = R[[x,1]]/2 + h/2 Sum[f[a + h/2 (2 k - 1)], {k, 1, m}];
            m = 2 m;];
          h = b - a;
          m = 1;
          j = 1;
           R = {{0}};
          R[[1,1]] = h/2 (f[a] + f[b]);
          Print[ R[[j]] ];
          While[j ≤ 11 && prec < 1, j ++;
           R = Append[ R, Table[0, {j}] ];
           reg[j - 1];
           For[ k = 1, k ≤ j - 1, k ++,
            R[[j,k+1]] = R[[j,k]] + (R[[j,k]] - R[[j-1,k]])/(4^k - 1); ] ];
          Return[ Print["Przyblizona wartosc calki wynosi: ", R[[j,j]]]]; ];

In[3]:= Romberg[0.0, 100, 0.00000001];

{42.0735}

Przyblizona wartosc calki wynosi: 0.0125142
```

4N

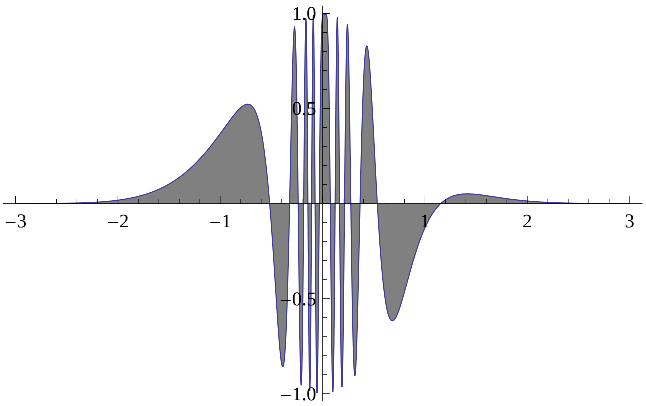
Calke mozna interpretowac jako pole powierzchni pod wykresem funkcji podcalkowej.

```
In[4]:= f[t_] := Cos[(1 + t)/(t^2 + 0.04)] e^-t^2;

In[5]:= Needs["Graphics`FilledPlot`"];
```

```
In[6]:= FilledPlot[f[t], {t, -3, 3}, PlotRange → Full]
```

Out[6]=



Obliczanie granicy $\lim_{x\to\infty}$ $F(x)=\int_{-\infty}^{x}\text{Cos}\left[\frac{1+t}{t^2+0.04}\right] e^{-t^2}\, dt$

```
In[7]:= Simpson[aa_, bb_, m_] :=
          Module[{a = N[aa], mm = m, b = N[bb], k, , X},
           mm = 2;
           h = (b - a)/(2 m);
           X_k_ = a + k h;
           Return[ h/6 (f[a] + f[b] + 2 Sum[f[X_(2 k)], {k, 1, m-1}] + 4 Sum[f[X_(2 k-1)], {k, 1, m}]) ]; ];

In[8]:= ka[a_, b_, err_] := Module[{c},
          c = (a + b)/2;
          ab = Simpson[a, b, err];
          ac = Simpson[a, c, err];
          cb = Simpson[c, b, err];
          If[ Abs[ab - ac - cb] < err,
           Return[ ac + cb ],
           Return[ka[a, c, err/2]]]]; ]

        Print["Wynik: Lim_(x→∞)F(x)=", ka[-10, 10.0, 0.00000001]];
```

Wynik: $\text{Lim}_{x\to\infty}F(x)=3.08214\times 10^{-17}$