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Zestaw 4 Zadanie 8

In[136]:=

$$f[x\_] := \frac{1}{1 + 5\,x^2};$$

In[137]:=

$$X = \text{Table}\left[x, \left\{x, -1, 1, \frac{1}{32}\right\}\right];$$

In[138]:=

```
Y = Map[f, X];
```

In[139]:=

```
XY = N[Transpose[Distribute[{X, Y}]]];
```

In[140]:=

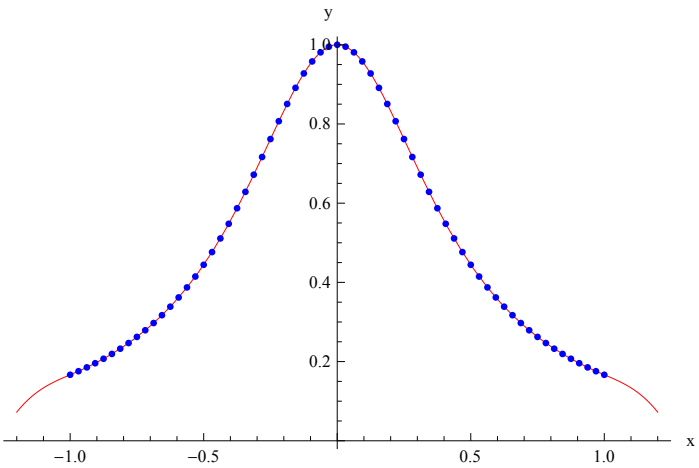
```
SplajnNat[XY0_] := Module[
                        {XY = XY0},
                        Dd = Module[
                                {k},
                                n = Length[XY] - 1;
                                X = Transpose[XY][[1]];
                                Y = Transpose[XY][[2]];
                                h = d = Table[0, {n}];
                                m = Table[0, {n + 1}];
                                a = b = c = v = Table[0, {n - 1}];
                                s = Table[0, {n}, {4}];

                                h[[1]] = X[[2]] - X[[1]];
                                d[[1]] = (Y[[2]] - Y[[1]])/h[[1]];

                            For[ k = 2, k ≤ n, k++,
                                h[[k]] = X[[k+1]] - X[[k]];
                                d[[k]] = (Y[[k+1]] - Y[[k]])/h[[k]];
                                a[[k-1]] = h[[k]];
                                b[[k-1]] = 2 (h[[k-1]] + h[[k]]);
                                c[[k-1]] = h[[k]];
                                v[[k-1]] = 6 (d[[k]] - d[[k-1]])];
                            ];

                        TrD := Module[
                                {k, t},
                                m[[1]] = 0;
                                m[[n+1]] = 0;
```

```
        For[ k = 2, k ≤ n - 1, k++,
          t = a[[k-1]] / b[[k-1]];
          b[[k]] = b[[k]] - t c[[k-1]];
          v[[k]] = v[[k]] - t v[[k-1]];
        ];

        m[[n]] = v[[n-1]] / b[[n-1]];

        For[ k = n - 2, 1 ≤ k, k--,
          m[[k+1]] = (v[[k]] - c[[k]] m[[k+2]]) / b[[k]];
        ];
      ];

      Pol := Module[
        {k},
        For[ k = 1, k ≤ n, k++,
          s[[k,1]] = Y[[k]];
          s[[k,2]] = d[[k]] - 1/6 h[[k]] (2 m[[k]] + m[[k+1]]);
          s[[k,3]] = m[[k]] / 2;
          s[[k,4]] = (m[[k+1]] - m[[k]]) / (6 h[[k]]);
        ];

      CS[t_] := Module[
          {j},
          For[ j = 1, j ≤ n, j++,
            If[ X[[j]] ≤ t && t < X[[j+1]], k = j ]; ];
          If[t < X[[1]], k = 1 ];
          If[X[[n+1]] ≤ t, k = n ];
          w = t - X[[k]];

Return[ ((s[[k,4]] w + s[[k,3]]) w + s[[k,2]]) w + s[[k,1]] ]; ];

      Dd;
      TrD;
      Pol;
    ]
```

In[141]:=

```
SplajnNat[XY];
dots =
  ListPlot[XY, PlotStyle → {Blue, PointSize[0.01]}, DisplayFunction → Identity];
gr = Plot[CS[x], {x, -1.2, 1.2}, PlotStyle → {Red}, DisplayFunction → Identity];
Show[gr, dots, AxesLabel → {"x", "y     "}]
Print["F(x) = ", Expand[CS[x]]];
```

Out[144]=



$$F(x) = 5.15425 - 14.3955\,x + 14.1119\,x^2 - 4.70397\,x^3$$