Bogdan Chwaliæski

Zestaw 3 Zadanie 9

In[276]:= $A = \begin{pmatrix} \frac{19}{12} & \frac{13}{12} & \frac{5}{6} & \frac{5}{6} & \frac{13}{12} & \frac{-17}{12} \\ \frac{13}{12} & \frac{13}{12} & \frac{5}{6} & \frac{5}{6} & \frac{-11}{12} & \frac{13}{12} \\ \frac{5}{6} & \frac{5}{6} & \frac{5}{6} & \frac{-1}{6} & \frac{5}{6} & \frac{5}{6} \\ \frac{5}{6} & \frac{5}{6} & \frac{-1}{6} & \frac{5}{6} & \frac{5}{6} & \frac{5}{6} \\ \frac{13}{12} & \frac{-11}{12} & \frac{5}{6} & \frac{5}{6} & \frac{13}{12} & \frac{13}{12} \\ \frac{-17}{12} & \frac{13}{12} & \frac{5}{6} & \frac{5}{6} & \frac{13}{12} & \frac{19}{12} \end{pmatrix}$;

```
In[277]:= Householder[Awejscie_] :=
              Module[
                  {k},
                  A1 = N[Awejscie];
                  n = Length[A1];
                  Q1 = Table[0, {i, n}];
                  V1 = Table[0, {i, n}];
                  W1 = Table[0, {i, n}];

                      For[k = 1, k ≤ n - 2, k++,
                        Module[
                              {i, j, suma},
                              suma = 0;
                                  For[j = k + 1, j ≤ n, j++,
                                        suma = suma + (A1[[j,k]])^2;
                                     ];
                              s0 = √suma ;
                              If[A1[[k+1,k]] < 0,
                                    s0 = -s0;
                                ];
                              r0 = √(2 (A1[[k+1,k]] + s0) s0) ;
                              For[j = 1, j ≤ k, j++,
                                    W1[[j]] = 0;
                                ];
                              W1[[k+1]] = (A1[[k+1,k]] + s0) / r0;
                              For[j = k + 2, j ≤ n, j++,
                                    W1[[j]] = A1[[j,k]] / r0;
                                ];

                                  For[j = 1, j ≤ k, j++,
                                        V1[[j]] = 0;
```

```mathematica
                                                ];
                                        For[i = k + 1, i ≤ n, i++,
                                                suma = 0;
                                                For[j = k + 1, j ≤ n, j++,
                                                        suma = suma + A1[[i,j]] W1[[j]];
                                                    ];
                                                V1[[i]] = suma;
                                            ];


                                                c = 0;
                                                For[j = k + 1, j ≤ n, j++,
                                                        c = c + W1[[j]] V1[[j]];
                                                    ];
                                                    For[j = 1, j ≤ k, j++,
                                                            (Q1)[[j]] = 0;
                                                        ];
                                                        For[j = k + 1, j ≤ n, j++,
                                                                (Q1)[[j]] = V1[[j]] - c W1[[j]];
                                                            ];


                                                            For[j = k + 2, j ≤ n, j++,
                                                                    A1[[j,k]] = 0;
                                                                    A1[[k,j]] = 0;
                                                                ];
                                                                A1[[k+1,k]] = - s0;
                                                                A1[[k,k+1]] = - s0;
                                                                    For[j = k, j ≤ n, j++,

        A1[[j,j]] = A1[[j,j]] - 4 (Q1)[[j]] W1[[j]];
                                                                        ];

        For[i = k + 1, i ≤ n, i++,

        For[j = i + 1, j ≤ n, j++,

        A1[[i,j]] = A1[[i,j]] - 2 W1[[i]] (Q1)[[j]] - 2 (Q1)[[i]] W1[[j]];

        A1[[j,i]] = A1[[i,j]];
                                                                            ];
                                                                        ];
                                                ];
                                            ];
        Return[N[A1] // MatrixForm]
            ];

In[278]:= ApoH = Householder[A]
```

Out[278]//MatrixForm=

$$\begin{pmatrix} 1.58333 & -2.39647 & 0. & 0. & 0. & 0. \\ -2.39647 & -0.0125957 & 0.934759 & 0. & 0. & 0. \\ 0. & 0.934759 & 2.36902 & -2.07886 & 0. & 0. \\ 0. & 0. & -2.07886 & 0.060241 & -1.26585 \times 10^{-15} & 0. \\ 0. & 0. & 0. & -1.26585 \times 10^{-15} & 1.27901 & -0.448514 \\ 0. & 0. & 0. & 0. & -0.448514 & 1.72099 \end{pmatrix}$$

In[279]:=

$$\text{ApoH} = \begin{pmatrix} 1.5833333333333333 & -2.396467307424734 & 0 & 0 \\ -2.396467307424734 & -0.01259572752922189 & 0.9347592788434194 & 0 \\ 0 & 0.9347592788434194 & 2.3690214303404695 & -2.0788632 \\ 0 & 0 & -2.0788632064407335 & 0.0602409\text{\textsterling} \\ 0 & 0 & 0 & -1.2658490090 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

In[280]:=
```
QR[A_, m0_] :=
  Module[
    {Awejscie = N[A], A1, i, m = m0},

    Print[ Chop[Awejscie, 5.0 × 10^-6] // MatrixForm ]
      i = 1;
        Do[
            {Q0, R0} = QRDecomposition[Awejscie];
            A1 = R0.Transpose[Q0];
              If[i == m,
                  Print["Macierz z wartosciami wlasnymi: "];

          Print[ MatrixForm[Chop[A1, 5.0 × 10^-6]]];, MatrixForm[Chop[A1, 5.0 × 10^-6]]];
                Awejscie = A1
                ], {i, 1, m}
        ]
    Return[0];
  ];
```

In[281]:= **QR[ApoH, 73]**

$$\begin{pmatrix} 1.58333 & -2.39647 & 0 & 0 & 0 & 0 \\ -2.39647 & -0.0125957 & 0.934759 & 0 & 0 & 0 \\ 0 & 0.934759 & 2.36902 & -2.07886 & 0 & 0 \\ 0 & 0 & -2.07886 & 0.060241 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1.27901 & -0.448514 \\ 0 & 0 & 0 & 0 & -0.448514 & 1.72099 \end{pmatrix}$$

Macierz z wartosciami wlasnymi:

$$\begin{pmatrix} 4. & 0 & 0 & 0 & 0 & 0 \\ 0 & 3. & 0 & 0 & 0 & 0 \\ 0 & 0 & -2. & 0 & 0 & 0 \\ 0 & 0 & 0 & 2. & 0 & 0 \\ 0 & 0 & 0 & 0 & -1. & 0 \\ 0 & 0 & 0 & 0 & 0 & 1. \end{pmatrix}$$