Q6 Solve test

Q6.1 Solve the system using the Jacobi method

Jacobi Banded with Residual Stopping Criteria

Solution vector x:

212.333

424.667

636

843.333

1041.67

1224

1381.33

1502.67

1575

1583.33

1510.67

1338

1044.33

606.667

Iterations: 861

Jacobi Banded with Consecutive Stopping Criteria

Solution vector x:

212.333

424.667

636

843.333

1041.67

1224

1381.33

1502.67

1575

1583.33

1510.67

1338

1044.33

606.667

Iterations: 830

Q6.2 Solve the system using the GS method

Gauss-Seidel Banded with Residual Stopping Criteria

Solution vector x:

212.333

424.667

636

843.333

1041.67

1224

1381.33

1502.67

1575

1583.33

1510.67

1338

1044.33

606.667

Iterations: 432

Gauss-Seidel Banded with Consecutive Stopping Criteria

Solution vector x:

212.333

424.667

636

843.333

1041.67

1224

1381.33

1502.67

1575

1583.33

1510.67

1338

1044.33

606.667

Iterations: 432

Q6.3 Solve the system using the SOR method

SOR Banded with Residual Stopping Criteria and omega = 1.15

Solution vector x:

212.333

424.667

636

843.333

1041.67

1224

1381.33

1502.67

1575

1583.33

1510.67

1338

1044.33

606.667

Iterations: 317

SOR Banded with Consecutive Stopping Criteria and omega = 1.15

Solution vector x:

212.333

424.667

636

843.333

1041.67

1224

1381.33

1502.67

1575

1583.33

1510.67

1338

1044.33

606.667

Iterations: 322

Q6.4 The SOR method results for different omega's

omega = 1.02, number to iterations = 415

omega = 1.04, number to iterations = 399

omega = 1.06, number to iterations = 383

omega = 1.08, number to iterations = 367

omega = 1.1, number to iterations = 352

omega = 1.12, number to iterations = 338

omega = 1.14, number to iterations = 324

omega = 1.16, number to iterations = 311

omega = 1.18, number to iterations = 298

omega = 1.2, number to iterations = 285

omega = 1.22, number to iterations = 273

omega = 1.24, number to iterations = 261

omega = 1.26, number to iterations = 250

omega = 1.28, number to iterations = 239

omega = 1.3, number to iterations = 228

omega = 1.32, number to iterations = 217

omega = 1.34, number to iterations = 207

omega = 1.36, number to iterations = 197

omega = 1.38, number to iterations = 188

omega = 1.4, number to iterations = 178

omega = 1.42, number to iterations = 169

omega = 1.44, number to iterations = 160

omega = 1.46, number to iterations = 151

omega = 1.48, number to iterations = 142

omega = 1.5, number to iterations = 133

omega = 1.52, number to iterations = 124

omega = 1.54, number to iterations = 116

omega = 1.56, number to iterations = 107

omega = 1.58, number to iterations = 99

omega = 1.6, number to iterations = 90

omega = 1.62, number to iterations = 80

omega = 1.64, number to iterations = 69

omega = 1.66, number to iterations = 53

omega = 1.68, number to iterations = 57

omega = 1.7, number to iterations = 59

omega = 1.72, number to iterations = 64

omega = 1.74, number to iterations = 73

omega = 1.76, number to iterations = 77

omega = 1.78, number to iterations = 87

omega = 1.8, number to iterations = 94

omega = 1.82, number to iterations = 104

omega = 1.84, number to iterations = 119

omega = 1.86, number to iterations = 137

omega = 1.88, number to iterations = 163

omega = 1.9, number to iterations = 194

omega = 1.92, number to iterations = 250

omega = 1.94, number to iterations = 329

omega = 1.96, number to iterations = 494

omega = 1.98, number to iterations = 989

Comment:

1. The residual-based and consecutive approximation stopping conditions result in identical solution and quite similar convergence speed.

2. Compare the convergence speed of the Jacobi method, the GS method and the SOR method:

SOR with a good choice of omega > GS > Jacobi > SOR with a bad choice of omega

3. For the SOR method, when omega is near to 0 or 2, the convergence speed is rather low compared to the omega close to 1

4. For the SOR method, when omega is near to 1, the solution and the convergence speed is similar to GS method (by definition).