Mark scheme: Autograder

Markers should refer to the autograder results, and briefly review the code. Markers may reduce the mark if the code contains errors or flaws not detected by the tests. For 1.1 there are two marks available which are not added by the autograder, for 2.2 there are 7 marks available not added by the autograder. Marks may removed for poor scholarship.

1.1 2 marks for passing all tests, 2 marks for adding further relevant tests, 1 mark for code which is is clear, concise, well formatted, and easy to understand
2.1 1 mark for passing all tests in test suite A, 1 mark for passing all tests in test suite B, 2 marks for passing all tests in test suite C
2.2 2 marks for passing all tests, up to a further 6 marks according to the rubric below

Mark scheme: Exploration and discussion

The following provides marking guidance, but note that intermediate marks may be awarded. All marks must be integers. You should reserve the highest marks for very high quality solutions, which would e.g. be suitable for use as model solutions. Marks may removed for poor scholarship.

Question 1.2

1.2: 7 marks
A comprehensive investigation of the problem. A clear and complete discussion which includes appropriate mathematical arguments where relevant, is fully supported with numerical evidence, and which draws appropriate conclusions from the numerical evidence. The discussion is supported with appropriate output, including at least one plot. Plots have appropriate axis ranges and scales, and are clearly and appropriately labelled. Code is clear, concise, well formatted, and easy to understand.

1.2: 5 marks
A good investigation of the problem, but the investigation may be more limited in scope. The discussion is generally clear, draws appropriate conclusions, and includes some appropriate mathematical arguments where relevant, but may be lacking in a small number of aspects. Conclusions may be overly strong, or may not be fully supported by numerical evidence. The discussion is supported with appropriate output, including at least one plot. Plots may be lacking in a small number of aspects. Code is generally clear, concise, well formatted, and easy to understand, but may be lacking in a small number of aspects.

1.2: 3 marks
A more limited investigation of the problem, perhaps failing to adequately investigate some important aspect of the problem. The discussion makes some relevant points, but a number of points may be unsupported by appropriate mathematical arguments or numerical evidence. At least one relevant conclusion is drawn. The discussion is supported with at least one plot, but plots may be lacking in a number of aspects. Code may be lacking in a number of aspects, and may be difficult to understand from a brief review of the code.

1.2: 1 mark
At least one relevant calculation is performed. There is a minimal discussion, which makes at least one relevant point.

1.2: 0 marks

Substantially incorrect or incomplete.

Question 2.2

2.2: 6 marks
A clear and complete description for the approach used, with a comprehensive justification for any decisions made, and supported with mathematical arguments where relevant. Code is clear, error free, easy to understand from a brief review, and commented appropriately.

2.2: 4 marks
A good description for the approach used, with a good justification for most decisions, and supported with some mathematical arguments. Some decisions may not be fully justified, and mathematical arguments may contain some minor gaps or errors. Code is generally clear, concise, well formatted, and easy to understand, but may be lacking in a small number of aspects.

2.2: 2 marks
A limited description of the approach used, with minimal justification for at least one important decision, but other elements may not be justified. There is minimal use of mathematical arguments, but this may be incomplete and contain gaps and errors. Code may be lacking in a number of aspects, and may be difficult to understand from a brief review of the code.

2.2: 0 marks
Substantially incorrect or incomplete.

Questions 3.1–3.3

3.1–3.2: 6 marks
3.3: 9 marks
A comprehensive investigation of the problem. A clear and complete discussion which includes appropriate mathematical arguments where relevant, is fully supported with numerical evidence, and which draws appropriate conclusions from the numerical evidence. The discussion is supported with appropriate output, including at least one plot. Plots have appropriate axis ranges and scales, and are clearly and appropriately labelled. Code is clear, concise, well formatted, and easy to understand.

3.1–3.2: 4 marks
3.3: 6 marks
A good investigation of the problem, but the investigation may be more limited in scope. The discussion is generally clear, draws appropriate conclusions, and includes some appropriate mathematical arguments where relevant, but may be lacking in a small number of aspects. Conclusions may be overly strong, or may not be fully supported by numerical evidence. The discussion is supported with appropriate output, including at least one plot. Plots may be lacking in a small number of aspects. Code is generally clear, concise, well formatted, and easy to understand, but may be lacking in a small number of aspects.

3.1–3.2: 2 marks
3.3: 3 marks
A limited investigation of the problem, perhaps failing to adequately investigate some important aspect of the problem. The discussion makes one or two relevant points, but a number of points may be unsupported by appropriate mathematical arguments or numerical evidence. The discussion is supported with at least one plot, but plots may be lacking in a number of aspects. Code may be lacking in a number of aspects, and may be difficult to understand from a brief review of the code.

3.1–3.2: 0 marks
3.3: 0 marks

Substantially incorrect or incomplete.

Question 3.4

3.4: 5 marks
A comprehensive critical comparison of the three methods, with thoroughly justified conclusions.

3.4: 3 marks
Some comparison of the three methods, but the discussion may be lacking in a number of aspects. Conclusions are sound but may not be fully justified.

3.4: 1 mark
A basic summary of the three methods.

3.4: 0 marks
Substantially incorrect or incomplete.