Question 1

a) 5 marks each for correct derivatives of $\ln(4 + \sin^2 x)$ and $e^{3x}\cos x$

b) 4 marks for correct number of possible situations. 6 marks for correct answer

c) 4 marks for correct output of $\lim_{x \to 0} \frac{\sin x}{x}$. 6 marks for the rest.

Question 2

2 marks for correct clustering during each iteration. 3 marks for correct distance during each step.

Question 3

There 5 different datasets, from easy to hard, with 3 different outputs, so there are totally 15 test cases. Dataset 1 requires only one iteration, mainly testing program’s correctness for cluster assignment and centroid update. Dataset 2 and 3 test program’s overall correctness for situations without orphaned centroids. Dataset 4 has one initial orphaned centroid and Dataset 5 has two, mainly verify program’s ability to handle one or multiple orphaned centroids situation. Following are the detailed grading scheme.

- Program gives correct output for all test cases: 50
- Program gives correct output for all test cases only for centroids and class membership: 42
- Program gives correct output for all test cases only for either centroids or class membership: 35
- Program does not give correct output for test case 5: 45
- Program gives correct output for only three test cases: 35
- Program gives correct output for only two test cases: 30
- Program gives correct output for only one test case: 25
- Program gives correct output for only the example provided to them: 20
- The code runs but the output is incorrect. Student has done the reallocation of centroids properly: 20
- Code gives correct output for limited number of iterations: 15
- The code does not compile: 0