School of Mathematics – Homework Feedback Form

Unit: Multivariable Calculus	Week/Problem Sheet: 5
Lecturer: Richard Porter	Set questions: 4, 6
Marker: Zohar Neu	

General Comments

Overall the questions were completed well. Some gaps in understanding were evident in places, however.

Please list and comment on those aspects which students found easy:

Please list and comment on those aspects which students found hard:

Please provide detailed feedback below, using a separate box for each set question, indicating:

- **Parts that most students were able to complete correctly.**
- **Parts that some students were able to complete correctly but some students found difficult, with a further indication of where they might find an outline of the correct method of solution.**
- **Parts that many students were unable to complete correctly and any general reasons why they all went wrong.**

Question 4

a) Completed well by almost all of the students.

b) Many students did not realise that the divergence of **F** could be calculated directly, and instead attempted to use the divergence theorem with spherical or cylindrical co-ordinate systems. Those that did the latter did not get the correct answer more often than not.
The main mistake made in this question was in setting the limits of the radial integral from 0 to 1, instead of from 0 to z, which should have been deduced from the geometry of the problem.

c) Many of the students did not use the divergence theorem in this question to get the solution, and only calculated it directly. When this was attempted, it was usually done correctly.

Question 6

Almost all of the students succeeded in finding the correct expression for the derivative of (1/r), as was done in previous work sheets.
Some difficulties where met in attempting to evaluate the integral, for example in determining the direction of the unit normal.
Nearly all of the students did not explain why this result may come about (the final part of the question).
Overall the calculations in the question were completed well, however.

Further Notes:

There were a number of questions outlined by students (and in particular those who did well) which would be helpful to look into and consider, as they are important to understand. These were:

1. How to determine orientation of normals
2. When and why should different co-ordinate systems be used
3. When and why should certain integrals over a variable be left out (for example when integrating over the surface of a sphere and the radius is known) – this relates to considering the geometry of the problem and omitting calculation of known values
4. Questions about how the spherical co-ordinate system is constructed, for example why the angles range over $[0,2\pi]$ and $[0,\pi]$ instead of both being the former. This relates to the geometry of the spherical co-ordinate system.