EMaII Class Test 2; 12th November 2009

Name: Degree Course:

Student number:

Name of Tutor: Name of marker:

Each question is worth 5 marks. There are 30 minutes available.
All working should be contained on this paper
No written material (course notes, textbooks etc.) is to be consulted during the test.

1 Calculate grad f where $f = 3x^2 + 2xy + 3zx^3$. Calculate the directional derivative at the point $(x, y, z) = (2, 3, 4)$ in the direction of the vector $(1, 1, 1)$.

2 Determine whether the unique stationary point at the origin is a maximum, minimum or saddle for the function

$$\phi(x, y, z) = x^2 + xy + 2y^2 + z^2 = 0$$

3 For the vector field $\boldsymbol{v} = x^3\boldsymbol{i} + y^2x\boldsymbol{j} + yz^3\boldsymbol{k}$ calculate div $\boldsymbol{v}$, curl $\boldsymbol{v}$ and div curl $\boldsymbol{v}$.