# Appendix A

## Splitting the Helmholtz Equation

The gradient in three dimensions is defined as:

|  |  |  |
| --- | --- | --- |
|  |  | (1) |

|  |  |  |
| --- | --- | --- |
|  |  | (2) |

=============================

By equation (1)

Calculation in one dimension for : (you have done that in your appendix)

Similarly for and :

Summing up the three equations one gets

Rearranging terms

By inspecting equations (1) and (2) one gets

Now the generalized Helmholtz equation is

|  |  |  |
| --- | --- | --- |
|  |  | (3) |

By defining

One arrives at

|  |  |  |
| --- | --- | --- |
|  |  | (4) |

The two dimensional case is trivially done in the same way, just omitting the z terms.