

## Preliminaries – notation

Three different notations for partial derivatives have been used in these notes. Make sure that you are familiar with all of them, and can recognise them interchangeably.

As you will have seen before, the  $n$ th partial derivative of a function  $f$  with respect to a variable  $y$  is commonly written as

$$\frac{\partial^n f}{\partial y^n}.$$

Often, however, particularly in part I of the course, we will use a more compact notation:

$$\partial_y^n f.$$

And when  $n \leq 4$  (ish), we will sometimes use the alternative notation

$$\begin{aligned} f_y & \text{ for } n = 1, \\ f_{yy} & \text{ for } n = 2, \\ f_{yyy} & \text{ for } n = 3, \text{ etc.} \end{aligned}$$

Here is a partial differential equation for a function  $f = f(y, t)$ , written in the three different notations:

$$\frac{\partial f}{\partial t} = f - f^2 + \frac{1}{\lambda} \frac{\partial^2 f}{\partial y^2}.$$

In the more compact notation this is written

$$\partial_t f = f - f^2 + \frac{1}{\lambda} \partial_y^2 f.$$

Finally, it can also be written

$$f_t = f - f^2 + \frac{1}{\lambda} f_{yy}.$$