

FORMULA SHEET

1. The characteristic eqs. for the 2nd order PDE with principal part $au_{xx} + 2bu_{xy} + cu_{yy}$ are:

$$\frac{dy}{dx} = \frac{b \pm \sqrt{b^2 - ac}}{a}.$$

2. The wave equation:

The formula of d'Alembert reads:

$$u(x, t) = \frac{1}{2} (f(x + ct) + f(x - ct)) + \frac{1}{2c} \int_{x-ct}^{x+ct} g(s) ds + \frac{1}{2c} \iint_{\Delta} F(\xi, \tau) d\xi d\tau.$$

3. The Laplace equation:

The Laplace operator in polar coordinates is given by:

$$\Delta = \frac{\partial^2}{\partial r^2} + \frac{1}{r} \frac{\partial}{\partial r} + \frac{1}{r^2} \frac{\partial^2}{\partial \theta^2}.$$

A fundamental solution $\Gamma(x)$ for the operator $-\Delta$ in \mathbb{R}^n is given by:

$$\Gamma(x) = \begin{cases} -\frac{1}{2\pi} \log |x| & , n = 2, \\ \frac{1}{n(n-2)c_n} |x|^{2-n} & , n \geq 3, \end{cases}$$

where c_n denotes the volume of the unit ball in \mathbb{R}^n .