

# A simple ODE mathematical model to assess the effectiveness of facemask wearing in COVID-19 pandemic

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In the present work we compare three methods (of fractional-step and implicit-explicit type for the approximation in time, and finite differences in space) to solve local and non-local reaction-diffusion equations of second-order, with non-homogeneous Neumann boundary conditions.

Two sets of numerical tests are presented, done for the Allen-Cahn equation - a typical example for the cubic nonlinearity, modeling *moving interface* problems, and analyzed in terms of the physical quantities of interest (diffusion, reaction). In the non-zero flux case ( $w \neq 0$ ), the Nonlocal Newton test yields an interface function with values around zero across the space interval, the Local Newton pushes the interface function to one in whole the space domain, while the Nonlocal Fractional Step shows a phase change between  $-1$  to  $+1$  around the center of the interval.

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