

**Task 1** (20 points)

Consider the retarded, advanced, and Feynman Green functions of the one-dimensional Poisson equation,

$$g_R(t-t') = (t-t')\Theta(t-t'), \quad (1)$$

$$g_A(t-t') = (t'-t)\Theta(t'-t), \quad (2)$$

$$g_F(t-t') = \frac{1}{2}|t'-t|. \quad (3)$$

Let us define

$$f(t') = f_0 \exp(-t'^2/a^2). \quad (4)$$

Calculate

$$x_R(t) = \int_{-\infty}^{\infty} dt' g_R(t-t')f(t'), \quad (5)$$

$$x_A(t) = \int_{-\infty}^{\infty} dt' g_A(t-t')f(t'), \quad (6)$$

$$x_F(t) = \int_{-\infty}^{\infty} dt' g_F(t-t')f(t'). \quad (7)$$

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The tasks are due Thursday, 07-MAR-2024. Have fun doing the problems!