MATH 54 SUMMER 2017, QUIZ 25

Find a solution to the following initial value problem.
\[ y'' + 10y' + 25y = 0; \quad y(0) = 3; \quad y'(0) = -11 \]

**Auxiliary equation:** \( r^2 + 10r + 25 = 0 \)
\[ (r + 5)^2 = 0 \]

**Roots:** \(-5\) with multiplicity 2

**General Solution:** \( y(t) = c_1 e^{-5t} + c_2 t e^{-5t} \)

**I.V.P.:**
\[ 3 = y(0) = c_1 e^{-5\cdot0} + c_2 \cdot 0 \cdot e^{-5\cdot0} = c_1 \]
\[ -11 = y'(0) = -5c_1 e^{-5\cdot0} - 5c_2 \cdot 0 \cdot e^{-5\cdot0} + c_2 e^{-5\cdot0} \]
\[ = -5c_1 + c_2 \]

\[ \Rightarrow \]
\[ c_1 = 3 \]
\[ c_2 = -11 + 5c_1 = -11 + 15 = 4 \]

**Solution:** \( y(t) = 3 e^{-5t} + 4te^{-5t} \)

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