Answer on Question#49928 - <Math> - <Calculus >

a) solve the differential equation $y'' - 9y' + 14y = e^{4x}$

Solution. Let's create characteristic equation:

$\mu^2 - 9\mu + 14 = 0 \Leftrightarrow (\mu - 2)(\mu - 7) = 0$, so $\mu_1 = 2$ and $\mu_2 = 7$

The homogeneous solution $y_h = c_1 e^{2x} + c_2 e^{7x}$

Let's determine partial solution $y_p = c_3 e^{4x}$, then we obtain equation

$16c_3 e^{4x} - 36c_3 e^{4x} + 14c_3 e^{4x} = e^{4x} \Leftrightarrow -6c_3 e^{4x} = e^{4x} \Leftrightarrow c_3 = -\frac{1}{6}$, so $y_p = -\frac{1}{6} e^{4x}$.

Thus, $y = y_h + y_p = c_1 e^{2x} + c_2 e^{7x} - \frac{1}{6} e^{4x}$ for $c_1, c_2 \in R$

Answer: $y = c_1 e^{2x} + c_2 e^{7x} - \frac{1}{6} e^{4x}$ for $c_1, c_2 \in R$

b) Determine the order and degree of this equation

Solution. It is second order non-homogeneous differential equation