Solve using the integrating factor method.

#1a. $\frac{dy}{dx}+\frac{2}{x}y=\ln x$

#1b. $\frac{dy}{dx}-\frac{y}{x}=x^3$

Solve using the auxiliary equation method

#2a. $12y'' - 5y' - 2y = 0 \qquad y(0) = 2 \qquad y'(0) = \frac{49}{12}$

#2b. $y'' + 8y' + 16y = 0 \qquad y(0) = 4 \qquad y'(0) = -15$

#2c. $y'' - 4y' + 5y = 0 \qquad y(0) = -2 \qquad y'(0) = -1$

#3a. Solve $y'' - y' + \frac{1}{4}y = 3 + e^{\frac{1}{2}x}$ using the table method for RHS

#3b. Solve $y'' - 36y = 4e^{6x}$

Find the Inverse Laplace Transform:

#4a. $\mathrm{L}^{-1}\left\{\dfrac{e^{-2s}}{s^3}\right\}$

#4b. $\mathrm{L}^{-1}\left\{\dfrac{e^{-\pi s}}{s^2+36}\right\}$

#4c. $\mathrm{L}^{-1}\left\{\dfrac{s}{s^2+4s+5}\right\}$

Solve this Exact form DE: #5. Solve this Exact form DE.
(leave solution in implicit form – do not solve for y)

#5a. $\left(5x+4y\right)dx+\left(4x-8y^3\right)dy=0$

#5b. $\left(3x^2y+e^y\right)dx+\left(x^3+xe^y-2y\right)dy=0$

#6. Solve the DE system using Eigenvalues/Eigenvectors:

$$\frac{dx}{dt} = -4x + 2y$$
$$\frac{dy}{dt} = -\frac{5}{2}x + 2y$$