Solution to Practice final problems:

Prof. 1) (i) $(1+x)y\,dx + x\,dy = 0$

$\Rightarrow (1+x)y = -xy'$

$\Rightarrow \frac{1+x}{x} = -\frac{y'}{y}$ → separable

$\Rightarrow \frac{1}{x} + 1 = -\frac{y'}{y}$ Integrate:

$\ln|x| + x = -\ln|y| + C$

$x e^x = \frac{A}{y} \Rightarrow \boxed{y = \frac{A}{x e^x}}$

(ii) $y' = y^{1/2}$

$\Rightarrow \frac{y'}{y^{1/2}} = 1$ → separable. Integrate:

$2\sqrt{y} = x + C$

$\Rightarrow \boxed{y = \left(\frac{1}{2}x + D\right)^2}$

Pract. final solution:

Prob. 1 continued

iii) $y' + xy = 3$

$\Rightarrow \frac{y'}{y} + x = \frac{3}{y}$

$\frac{dy}{y} + x\,dx = \frac{3}{y}\,dx$ → not separable

iv) $xy' - y\ln x = xy^2$

$\Rightarrow x\,dy = (y\ln x + xy^2)\,dx$

$\frac{dy}{y} = \left(\frac{\ln x}{x} + \frac{y}{=}\right)dx$ → not separable