Discussion 2

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1)

$$5\frac{\mathrm{d}y}{\mathrm{d}x} + 25xy = 1 \implies \frac{\mathrm{d}y}{\mathrm{d}x} + 5xy = \frac{1}{5}$$
$$P(x) = 5x \qquad f(x) = \frac{1}{5}$$
$$\mu(x) = \mathrm{e}^{\int 5x \mathrm{d}x} = \mathrm{e}^{\frac{5x^2}{2}}$$

2)

$$x^2\frac{\mathrm{d}y}{\mathrm{d}x} + 2xy = x \implies \frac{\mathrm{d}y}{\mathrm{d}x} + \frac{2y}{x} = \frac{1}{x}$$
$$P(x) = \frac{2}{x} \qquad f(x) = \frac{1}{x}$$
$$\mu(x) = \mathrm{e}^{\int \frac{2}{x} \mathrm{d}x} = \mathrm{e}^{2\ln|x|} = x^2$$

3)

$$\sin(x)\frac{\mathrm{d}y}{\mathrm{d}x} + \sin(2x)y = 1 \implies \frac{\mathrm{d}y}{\mathrm{d}x} + \frac{\sin(2x)}{\sin(x)}y = \csc x = \frac{\mathrm{d}y}{\mathrm{d}x} + \frac{2\sin(x)\cos(x)}{\sin(x)}y$$
$$\frac{\mathrm{d}y}{\mathrm{d}x} + 2\cos(x)y = \csc(x) \implies P(x) = 2\cos(x) \qquad f(x) = \csc(x)$$
$$\mu(x) = \mathrm{e}^{\int 2\cos(x)\mathrm{d}x} = \mathrm{e}^{2\sin(x)}$$