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Q No: 2, 3

MT-204

CAL-2

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Q No

(Using the substitution)

$$x = vy \quad \text{and} \quad dx = v dy + y dv$$

to will be

$$y(v dy + y dv) + vy(\ln vy - \ln y - 1) dy = 0$$

$$vy dy + y^2 dv + vy(\ln v - 1) dy = 0$$

$$(vy + vy \ln v - vy) dy + y^2 dv = 0$$

$$vy \ln v dy + y^2 dv = 0$$

$$\rightarrow \frac{v \ln v}{y} dy + dv = 0$$

$$\therefore \frac{dy}{y} + \frac{dv}{v \ln v} = 0, \quad \int \frac{dy}{y} + \int \frac{dv}{v \ln v} = c_1$$

$$\ln |y| + \ln |\ln v| = c_1, \quad \ln |y \ln v| = c_1$$

$$y \ln v = c$$

Now apply the initial condition
 $y(1) = e$ to get

$$\ln(e) = c \rightarrow c = -c \rightarrow c = -c$$

$$y \ln \left| \frac{x}{y} \right| = -e$$

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