2000 **10.** **(a)** If

$$x\frac{dy}{dx} + xy\frac{dy}{dx} - 1 = 0$$

and $y = 2$ when $x = e$, find, correct to two places of decimals, the positive value of y when $x = e^2$.

$$x\frac{dy}{dx}(1+y) = 1$$

$$\int_2^y (1+y)dy = \int_e^{e^2} \frac{dx}{x}$$

$$\left[y + \tfrac{1}{2}y^2\right]_2^y = \left[\ln x\right]_e^{e^2}$$

$$y + \tfrac{1}{2}y^2 - 2 - 2 = 2 - 1$$

$$y^2 + 2y - 10 = 0$$

$$y = 2.32$$

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