Progression

Double derivate $u(x)$, multiply by $-1$

$u(x) = 1 - (1 - e^{-10})x - e^{-10x}$

$u'(x) = [1]' - [(1 - e^{-10})x]' - [e^{-10x}]'$

$\quad = -(1 - e^{-10}) - (e^{-10x} \times [-10x]')$

$\quad = -(1 - e^{-10}) + 10 e^{-10x}$

$u''(x) = [-(1 - e^{-10})]' + [10 e^{-10x}]'$

$\quad = 10 e^{-10x} \times [-10x]'$

$\quad = -100 e^{-10x} \quad = -f(x)$

Further :

$$f(x) = -u''(x) = -\frac{d^2 u}{dx^2} \qquad \text{qed.}$$