14. $f(x) = \underbrace{x^2}_{P}\ \underbrace{e^{-x}}_{Q}$

① $P' = 2x \qquad Q' = e^{-x} \cdot \frac{d}{dx}(-x)$

$Q' = -e^{-x}$

$P'Q + PQ'$

$f'(x) = 2xe^{-x} + x^2(-e^{-x})$

$= e^{-x}(2x - x^2)$

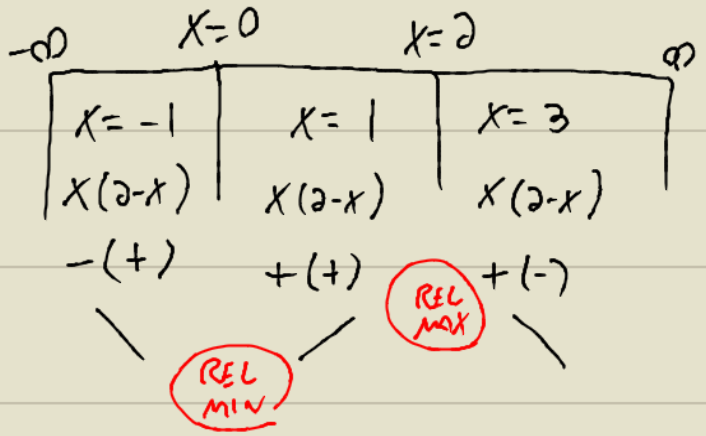
② $e^{-x}(2x - x^2) = 0$

$e^{-x} \cdot x(2-x) = 0$

$e^{-x} \neq 0$ $\quad x = 0$ $\quad 2 - x = 0$

$2 = x$

③



DEC $(-\infty, 0)$

INC $(0, 2)$

DEC $(2, \infty)$

④ REL MIN

$x = 0$

$y = x^2 e^{-x}$

$y = 0^2 e^{-0}$

$y = 0$

REL MIN $(0, 0)$

REL MAX

$x = 2$

$y = x^2 e^{-x}$

$y = 2^2 e^{-2}$

$y = \frac{4}{e^2}$

REL MAX $\left(2, \frac{4}{e^2}\right)$