Note : when $p <$ power of $g(x)$

then ans $\boxed{T \cdot C = g(x)}$

$p = \cancel{4}(-2) < 2$

Here $g(x) = x^2$

$p < 2$ (i.e power of $g(x)$)

ans $O(g x)$

$$T(x) = \Theta\left(x^p + x^p \int_1^x \frac{u^2}{u^{p+1}}\, du\right)$$

$$= \Theta\left(x^p + x^p \int_1^x \left(u^2 \cdot u^{-(p+1)}\right) \cdot du\right)$$

$$= \Theta\left(x^p + x^p \int_1^x u^{2-p-1}\, du\right)$$

$$= \Theta\left(x^p + x^p \int_1^x u^{1-p}\, du\right)$$

$$= \Theta\left(x^p + x^p \left(\frac{u^{1-p+1}}{1-p+1}\right)_1^x\right)$$

$$= \Theta\left(x^p + x^p \left(\frac{u^{2-p}}{2-p}\right)_1^x\right)$$

$$= \Theta\left(x^p + x^p\left(\frac{x^{2-p}}{2-p} - \cancel{\frac{1^{2-p}}{2-p}}\right)\right)$$

$$= \Theta\left(\underline{x^p} + \frac{x^p \cdot x^{2-p}}{2-p}\right)$$

$$= \Theta\left(x^p + \frac{\cancel{x^p} \cdot x^2 \cdot \cancel{x^{-p}}}{2-p}\right)$$

$$= \Theta(\underbrace{\cancel{x^p}}_{\text{less dom}} + x^2) = \Theta(x^2)$$