b) x^{2x}

- First, let's write b) as :

$$f(x) = x^{2x}$$

- Second, let's take logs of both sides to get :

$$\ln(f(x)) = \ln(x^{2x})$$

- Step 1 : Note that $\ln(x^a) = a \cdot \ln(x)$. Hence,

$$\ln(f(x)) = 2x \cdot \ln(x)$$

- Step 2 : Noting that $\ln(f(x))' = \frac{f'(x)}{f(x)}$, by differenciating both sides

we get :

$$\ln(f(x))' = (2x \cdot \ln(x))' \Rightarrow \frac{f'(x)}{f(x)} = \underbrace{2 \cdot \ln(x) + 2x \cdot \frac{1}{x}}_{\text{Because } (f(x) \cdot g(x))' = f'(x)\, g(x) + f(x) \cdot g'(x)}$$

- Step 3 : Isolate $f'(x)$ in your left-hand side to get :

$$f'(x) = f(x) \cdot (2\ln(x) + 2)$$

- Step 4 : Substituting $f(x) = x^{2x}$, we get :

$$f'(x) = x^{2x} \cdot (2\ln(x) + 2)$$

- Step 5 : taking 2 as a common factor, we can rewrite the previous expression as :

$$f'(x) = x^{2x} \cdot (2(\ln(x) + 1))$$

→ Hence, the general derivative of $x^{\beta x} \Rightarrow (x^{\beta x})' = \boxed{x^{\beta x} \cdot (\beta \cdot (\ln(x) + 1))}$