



Problem:

Expand function  $f(x) = e^{2x}$  into a power series in the vicinity of the point  $x_0 = 3$ .

Solution:

$f(x) = e^{2x}$  let's find the expansion of  $f$  in the vicinity of the point  $x_0 = 3$ :

$$f(x) = f(x_0) + \frac{f'(x_0)}{1!}(x - x_0) + \dots + \frac{f^{(n)}(x_0)}{n!}(x - x_0)^n + \dots, \quad f^{(n)}(x_0) = 2^n e^{2x_0} = 2^n e^6 \Rightarrow$$

$$\Rightarrow e^{2x} = e^6 + \frac{2e^6}{1!}(x - 3) + \frac{2^2 e^6}{2!}(x - 3)^2 + \dots + \frac{2^n e^6}{n!}(x - 3)^n + \dots = \sum_{n=0}^{\infty} \frac{2^n e^6}{n!}(x - 3)^n,$$

We have obtained the expansion of  $f(x)$  in powers  $(x - 3)$ .