2. $f'(x) = \dfrac{f(x+\Delta x) - f(x)}{\Delta x}$

$= \dfrac{e^{-(x+\Delta x)/3} - e^{-x/3}}{\Delta x}$

$x = 0.7$

Δx	$f'(x)$	fx. error	exact $f'(x) = -\frac{1}{3}e^{-x/3}$
10^{-4}	-0.263958	$-1.66622 \cdot 10^{-5}$	$f'(0.7) = -0.2639$
10^{-5}	-0.2639427	$-1.66614 \cdot 10^{-6}$	
10^{-6}	-0.26396314	$-1.84874263 \cdot 10^{-7}$	
10^{-7}	-0.2639632	$4.243015873 \cdot 10^{-8}$	
10^{-8}	-0.263963	$-7.15251247 \cdot 10^{-7}$	
10^{-9}	-0.26396	$-1.20804723 \cdot 10^{-5}$	
10^{-10}	-0.264	$-1.39455\,8088 \cdot 10^{-4}$	

↑ Note: I am just writing down calc. output. I am directly using output in calculation not retyping it in.

∴ The error starts growing because we've essentially run out of precision. We are seeing the inherent error of

floating point / finite precision calculations