Chapter 13 / **Example 6**

Average and instantaneous rate of change

During one month, the temperature of the water in a pond is modelled by the function $T(n) = 18 + 12ne^{-\frac{n}{3}}$, where n is measured in days and T is measured in degrees Celsius.

a Find the average rate of change in temperature during the first 18 days of the month. Include units in your answer.

b Find T'(n).

c Find the exact value of the instantaneous rate of change in temperature on day 18. Check your answer using a GDC.

Average rate of change $= \dfrac{T(18) - T(0)}{18 - 0}$

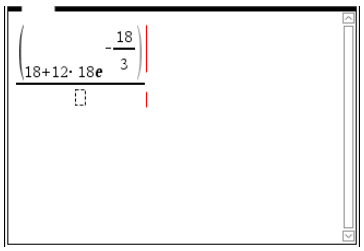
Open a new document and add a Calculator page.

Press ctrl to enter a fraction template.

Type (18 + 12 × 18 e^x (−)

Press ctrl and enter 18 in the numerator and 3 in the denominator.

Press ▶ ▶ ▶ to exit the parentheses.



Continue by typing − (18 + 12 × 0 e^x (−)

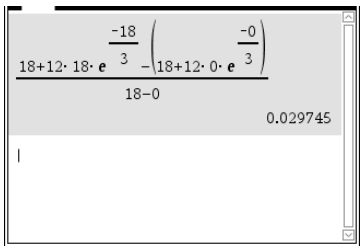
Press ctrl and enter 0 in the numerator and 3 in the denominator.

Press ▼ ▼ to navigate down to the denominator

Type 18 − 0

Press enter.

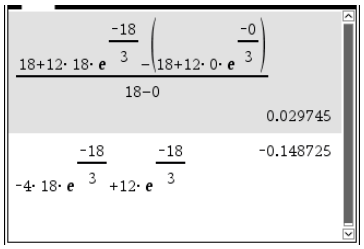
The average rate of change is 0.0297 °C/day



$T'(n) = -4ne^{-\frac{n}{3}} + 12e^{-\frac{n}{3}}$

To find $T'(18)$, calculate $-4 \times 18e^{-\frac{18}{3}} + 12e^{-\frac{18}{3}}$

The instantaneous rate of change is -0.149 °C/day



Chapter 13 / **Example 6**

Average and instantaneous rate of change

To calculate the instantaneous rate of change press [menu] and select $\frac{d}{d\square}\square$

Enter N in the denominator and the function $18+12ne^{-\frac{n}{3}}$

Press ▶ ▶ ▶ to exit the parentheses.

Enter [ctrl] [=] ([|≠≥▸]) and select the vertical bar (|)

Type N = 18 and press [enter].

The instantaneous rate of change is -0.149 °C/day as found before.