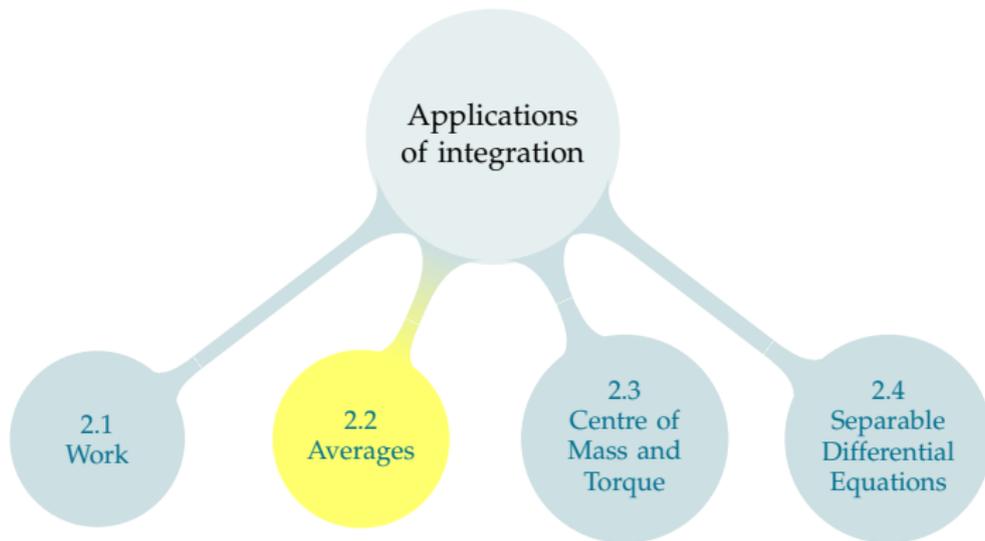
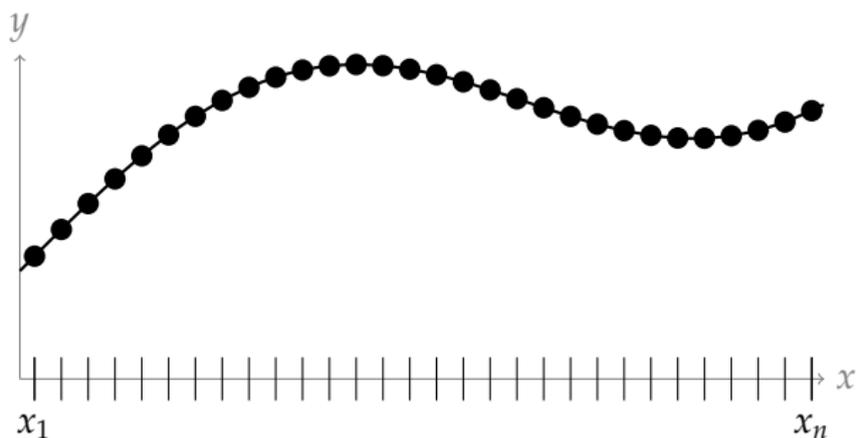


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$$\text{Average} \approx \frac{f(x_1) + \cdots + f(x_n)}{n}$$

$$\begin{aligned} \text{Average} &= \lim_{n \rightarrow \infty} \left[\frac{1}{n} \sum_{i=1}^n f(x_i) \right] = \lim_{n \rightarrow \infty} \left[\frac{(b-a)}{(b-a)n} \sum_{i=1}^n f(x_i) \right] \\ &= \lim_{n \rightarrow \infty} \left[\frac{1}{b-a} \sum_{i=1}^n f(x_i) \Delta x \right] = \frac{1}{b-a} \int_a^b f(x) dx \end{aligned}$$

Average

Let $f(x)$ be an integrable function defined on the interval $a \leq x \leq b$. The average value of f on that interval is

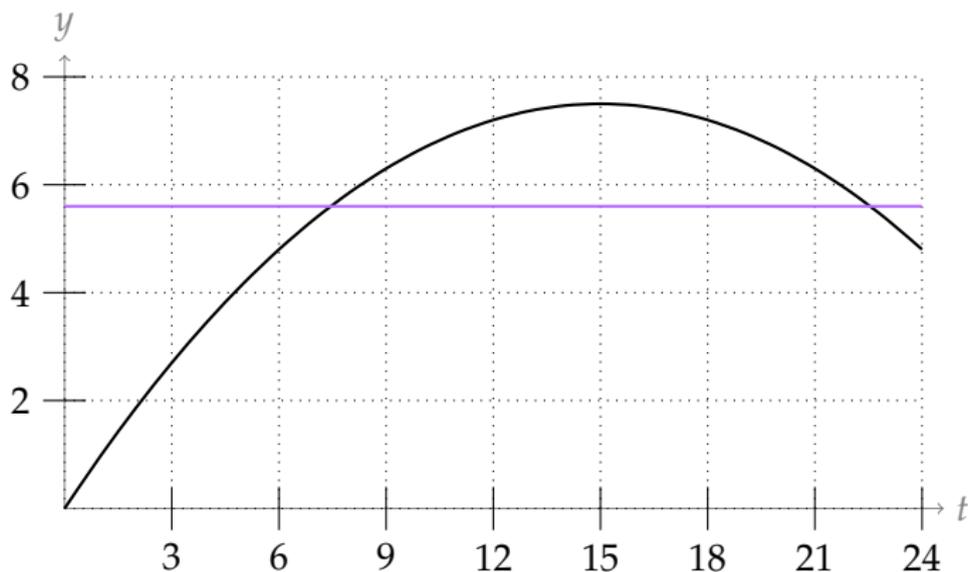
$$f_{\text{ave}} = \frac{1}{b-a} \int_a^b f(x) \, dx$$

The temperature in a certain city at time t (measured in hours past midnight) is given by

$$T(t) = t - \frac{t^2}{30}$$

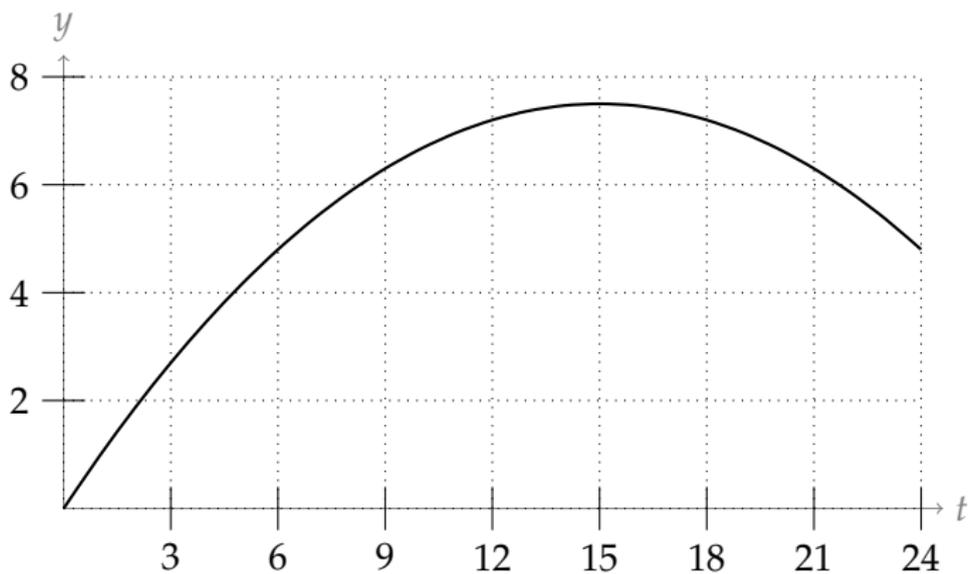
What was the average temperature of one day (from $t = 0$ to $t = 24$)?

Let's check that our answer makes some intuitive sense.

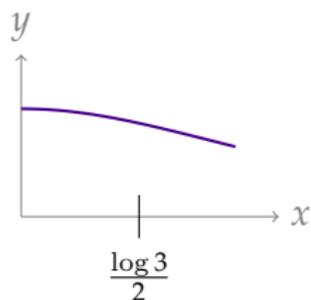


Since the temperature is always between 0 and 8, we expect the average to be between 0 and 8

Let's also recall the motivation for our definition



Find the average value of the function $f(x) = \frac{e^x}{e^{2x} + 1}$ over the interval $\left[0, \frac{\log 3}{2}\right]$.



AVERAGE VELOCITY

Let $x(t)$ be the position at time t of a car moving along the x -axis. The velocity of the car at time t is the derivative $v(t) = x'(t)$. The average velocity of the car over the time interval $a \leq t \leq b$ is: