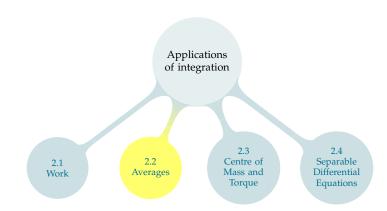
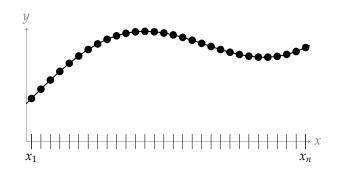
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Average
$$\approx \frac{f(x_1) + \dots + f(x_n)}{n}$$

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

Average

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

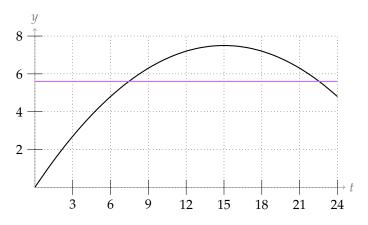
$$f_{\text{ave}} = \frac{1}{b-a} \int_{a}^{b} f(x) \, \mathrm{d}x$$

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

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

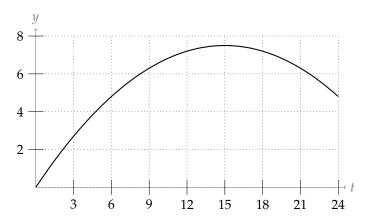
What was the average temperature of one day (from t = 0 to t = 24)?

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



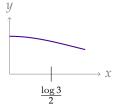
Since the temperature is always between 0 and 8, we expect the average to be between 0 and 8 $\,$

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

$$\left[0,\tfrac{\log 3}{2}\right].$$



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 $a \le t \le b$ is: