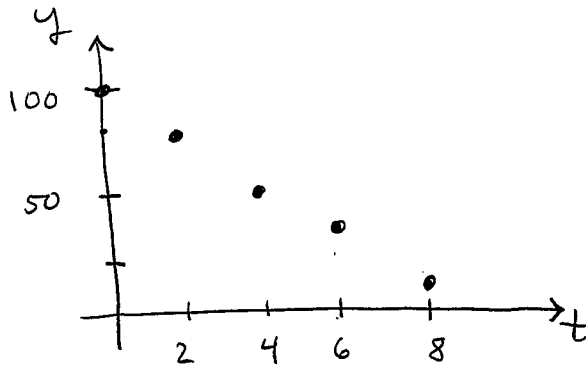


(1) [5] The population of a certain town is growing at a decreasing rate of $r(t)$ people per year. Using the following data for $r(t)$, give lower and upper estimates for the change in population over the time period $t = 0$ to $t = 8$. State units with your answer.

t (yrs)	0	2	4	6	8
$r(t)$ (people/yr)	100	85	50	38	10



Let $P =$ change in population.

$$P < (100)(2) + (85)(2) + (50)(2) + (38)(2)$$

$$\therefore P < 546$$

$$P > (85)(2) + (50)(2) + (38)(2) + (10)(2)$$

$$P > 366$$

$$\therefore 366 < P < 546 \text{ people.}$$

(2) [5] The following limit represents the area under the graph of a certain function $f(x)$ over a certain interval $[a, b]$. Determine $f(x)$ and $[a, b]$:

$$\lim_{n \rightarrow \infty} \sum_{i=1}^n \frac{\pi}{3n} \tan\left(\frac{i\pi}{3n}\right)$$

$$= \lim_{n \rightarrow \infty} \sum_{i=1}^n \tan\left(i \frac{(\pi/3)}{n}\right) \frac{(\pi/3)}{n}$$

$$= \lim_{n \rightarrow \infty} \sum_{i=1}^n f(x_i) \Delta x \quad \underbrace{i \Delta x}_{i \Delta x} \quad \underbrace{\frac{(\pi/3)}{n}}_{\Delta x}$$

$$\therefore f(x) = \tan(x)$$

$$[a, b] = \left[0, \frac{\pi}{3}\right].$$