(1) [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 $[a, b]$:

$$\lim_{n\to\infty} \sum_{i=1}^{n} \frac{\pi}{6n} \tan\left(\frac{i\pi}{6n}\right)$$

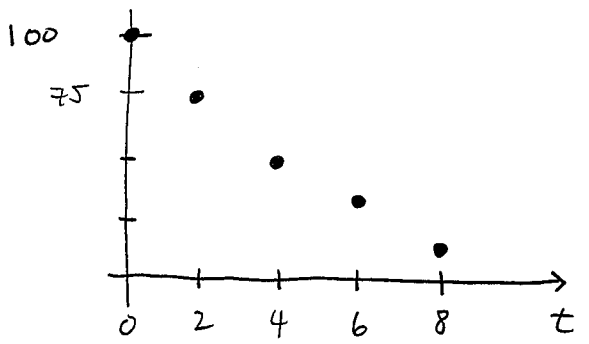
$$= \lim_{n\to\infty} \sum_{i=1}^{n} \tan\left(\underbrace{i\,\frac{(\pi/6)}{n}}_{x_i = i\Delta x}\right) \underbrace{\frac{(\pi/6)}{n}}_{\Delta x}$$

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

$$[a, b] = \left[0, \tfrac{\pi}{6}\right]$$

(2) [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	75	50	36	10



Let P = population change.

Then $P < (100)(2) + (75)(2) + (50)(2) + (36)(2)$

$\therefore P < 522$ people.

$P > (75)(2) + (50)(2) + (36)(2) + (10)(2)$

$P > 342$ people.

$\therefore \quad 342 < P < 522$ people