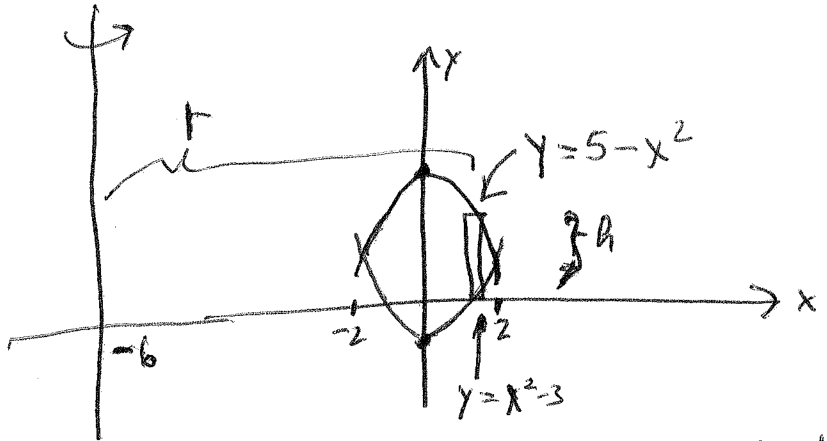
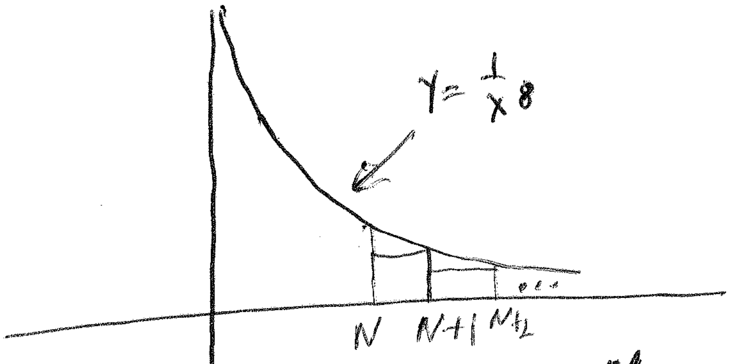
①



Consider the rectangle with x-coordinate x. Spin the rectangle. Get a shell of volume $2\pi r h t$. where

$t = dx$, $r = x+6$, and $h = 5-x^2-(x^2-3) = 8-2x^2$

③



Approximate $\sum_{k=1}^{\infty} \frac{1}{k^8}$ using $\sum_{k=1}^{N} \frac{1}{k^8}$. So the distance between $\sum_{k=1}^{\infty} \frac{1}{k^8}$ and $\sum_{k=1}^{N} \frac{1}{k^8}$ is

$$\left|\sum_{k=1}^{\infty} \frac{1}{k^8} - \sum_{k=1}^{N} \frac{1}{k^8}\right| = \sum_{k=N+1}^{\infty} \frac{1}{k^8} = \text{area inside the boxes}$$

$$\leq \text{area under the curve} = \int_N^{\infty} \frac{1}{x^8}\,dx = \lim_{b\to\infty} \left.\frac{1}{-7x^7}\right]_N^b$$

$$= \lim_{b\to\infty} \frac{1}{-7b^7} + \frac{1}{7N^7} = \frac{1}{7N^7}$$