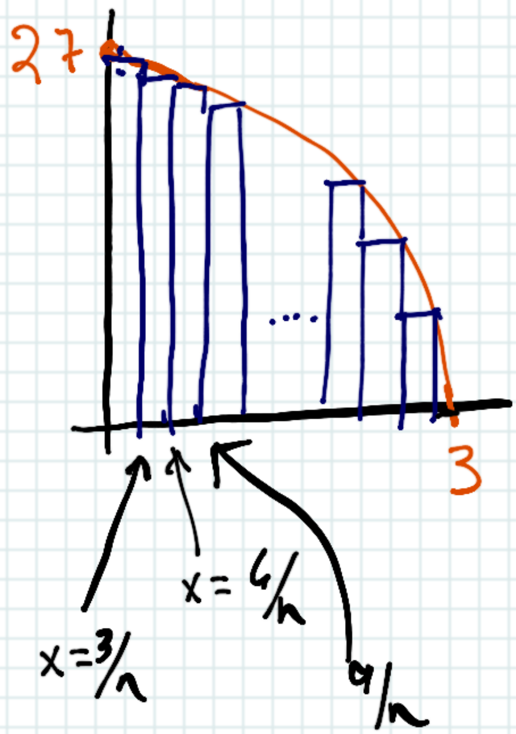
Find the area beneath the $f(x) = 27 - x^3$ in the first quadrant.



- n rectangles $\Rightarrow$ $3/n$ width

Rectangle 1: $A_1 = \left(\frac{3}{n}\right)\left(27 - \left(\frac{3}{n}\right)^3\right)$

#2: $A_2 = \left(\frac{3}{n}\right)\left(27 - \left(\frac{6}{n}\right)^3\right)$

#3: $A_3 = \left(\frac{3}{n}\right)\left(27 - \left(\frac{9}{n}\right)^3\right)$

$\vdots$

#n: $A_n = \left(\frac{3}{n}\right)\left(27 - \left(\frac{3n}{n}\right)^3\right)$

$$A = \left(\frac{3}{n}\right)\left[\left(27 - \left(\frac{3}{n}\right)^3 + 27 - \left(\frac{6}{n}\right)^3 + 27 - \left(\frac{9}{n}\right)^3 + \cdots + 27 - \left(\frac{3n}{n}\right)^3\right)\right]$$

$$= \left(\frac{3}{n}\right)\left[27n - \left[\left(\frac{3}{n}\right)^3 + \left(\frac{6}{n}\right)^3 + \left(\frac{9}{n}\right)^3 + \cdots + \left(\frac{3n}{n}\right)^3\right]\right]$$

$$= \left(\frac{3}{n}\right)\left[27n - \left[\frac{3^3}{n^3} + \frac{6^3}{n^3} + \frac{9^3}{n^3} + \cdots + \left(\frac{3^3 n^3}{n^3}\right)\right]\right]$$

$$= \left(\frac{3}{n}\right)\left[27n - \frac{1}{n^3}\left[3^3 + 6^3 + 9^3 + \cdots + 3^3 n^3\right]\right]$$

$$= \left(\frac{3}{n}\right)\left[27n - \frac{1}{n^3}\left[3^3 \cdot 1^3 + 3^3 \cdot 2^3 + 3^3 \cdot 3^3 + \cdots + 3^3 n^3\right]\right]$$

$$= \left(\frac{3}{n}\right)\left[27n - \frac{3^3}{n^3}\left[1^3 + 2^3 + 3^3 + \cdots + n^3\right]\right]$$

$$= 81 - \frac{3^4}{n^4}\left[1^3 + 2^3 + 3^3 + \cdots + n^3\right]$$

$$= 81 - \frac{81}{n^4}\left[\frac{n^2(n+1)^2}{4}\right]$$

As $n \to \infty$, $A = 81 - 81/4$

$$= 81\left(3/4\right)$$

$$= 243/4$$