5.1 examples

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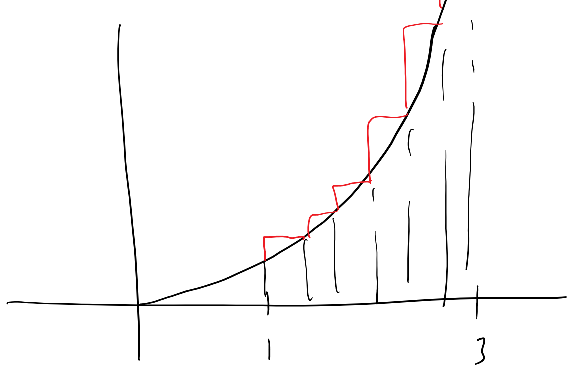
5.1 examples

Calculus AB, section 5.1 (Approximating and Computing Area)

<u>Example 1</u> – Computing Right-Endpoint Approximations

$R_6 = RRAM_6$

Calculate ~~R_4 and~~ R_6 for $f(x) = x^2$ on the interval [1, 3].



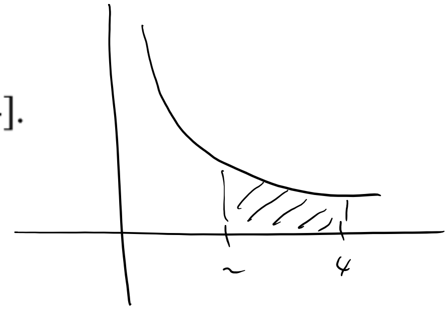
$$\left(\frac{4}{3}\right)^2 \cdot \frac{1}{3} + \left(\frac{5}{3}\right)^2 \cdot \frac{1}{3} + \left(\frac{6}{3}\right)^2 \cdot \frac{1}{3} + \left(\frac{7}{3}\right)^2 \cdot \frac{1}{3} + \left(\frac{8}{3}\right)^2 \cdot \frac{1}{3} + \left(\frac{9}{3}\right)^2 \cdot \frac{1}{3}$$

$$= 10.037$$

This is an overestimate

Example 2

Calculate $R_{\underset{4}{\cancel{6}}}$, $L_{\underset{4}{\cancel{6}}}$ and $M_{\underset{4}{\cancel{6}}}$ for $f(x) = x^{-1}$ on [2, 4].



$$R_4 = \frac{1}{2}\left(\frac{1}{2.5} + \frac{1}{3} + \frac{1}{3.5} + \frac{1}{4}\right)$$

$$= 0.634$$

$$M_4 = \frac{1}{2}\left(\frac{1}{2.25} + \frac{1}{2.75} + \frac{1}{3.25} + \frac{1}{3.75}\right) = 0.691$$

$$L_4 = \frac{1}{2}\left(\frac{1}{2} + \frac{1}{2.5} + \frac{1}{3} + \frac{1}{3.5}\right) = 0.759$$

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Example 3 – Calculating Area as a Limit

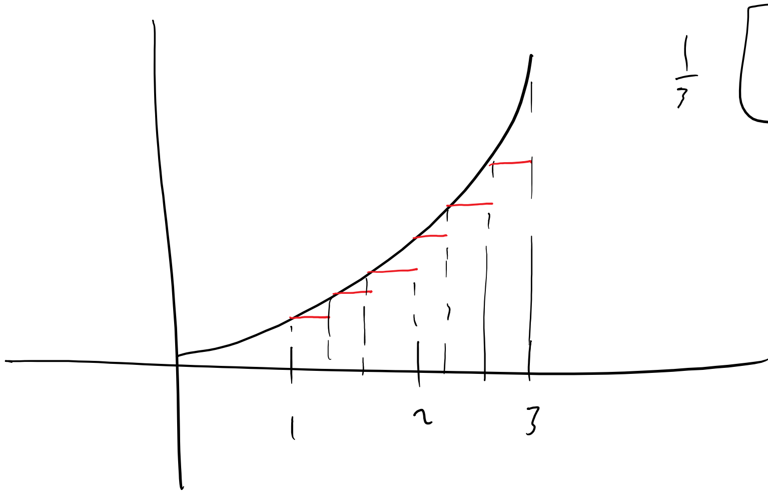
Calculate the area under the graph of f(x) = x over [0, 4] in three ways:

a. $\lim_{N \to \infty} R_N$ b. $\lim_{N \to \infty} L_N$ c. Using geometry

Example 4

Let A be the area under the graph of f(x) = $2x^2 - x + 3$ over [2, 4]. Find a formula for R_N and compute A as the limit $\lim_{N \to \infty} R_N$.

do L_6 on $y = x^2$ on $[1, 3]$



$$\frac{1}{3}\left[1^2 + \left(\frac{4}{3}\right)^2 + \left(\frac{5}{3}\right)^2 + 2^2 + \left(\frac{7}{3}\right)^2 + \left(\frac{8}{3}\right)^2\right]$$

$$= 7.370$$

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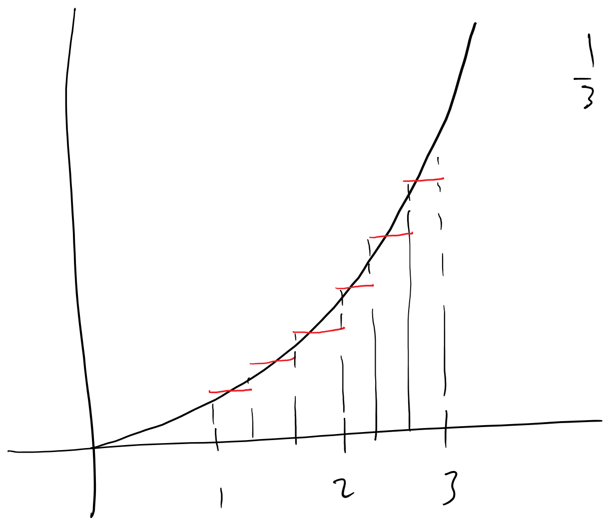
Do M_6 on $f(x) = x^2$ on $[1, 3]$



$$\frac{1}{3}\left[\left(\frac{7}{6}\right)^2 + \left(\frac{9}{6}\right)^2 + \left(\frac{11}{6}\right)^2 + \left(\frac{13}{6}\right)^2 + \left(\frac{15}{6}\right)^2 + \left(\frac{17}{6}\right)^2\right]$$

$$= 8.648$$

$$\frac{10.037 + 7.37}{2} = 8.7035$$