

7.1 examples

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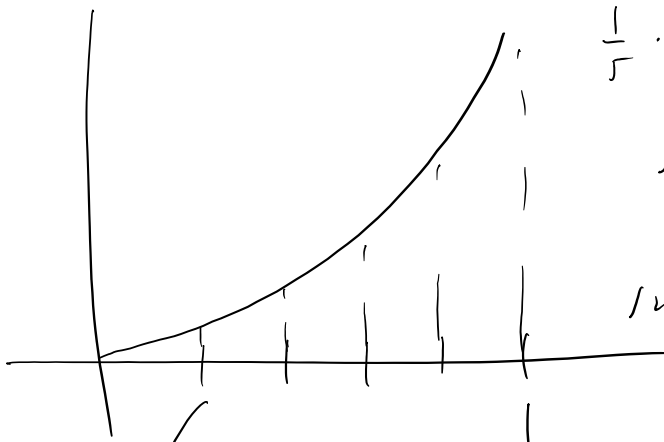
Calculus AB – Trapezoidal Rule (section 7.1) estimate the area

Area of trapezoid = $\frac{b_1 + b_2}{2} \cdot h$ under $y = \sin x^2$ from $x=0$ to $x=1$

Example 1

5R

Calculate the ~~trapezoidal~~ trapezoidal approximation to $\int_0^1 \sin(x^2) dx$.



$$\frac{1}{5} \cdot \left(\frac{\sin 0^2 + \sin\left(\frac{1^2}{5}\right)}{2} + \frac{\sin\left(\frac{1^2}{5}\right) + \sin\left(\frac{2^2}{5}\right)}{2} + \frac{\sin\left(\frac{2^2}{5}\right) + \sin\left(\frac{3^2}{5}\right)}{2} + \frac{\sin\left(\frac{3^2}{5}\right) + \sin\left(\frac{4^2}{5}\right)}{2} + \frac{\sin\left(\frac{4^2}{5}\right) + \sin(1)}{2} \right)$$

$$\frac{1}{5} \cdot \frac{1}{5} \left(\sin 0^2 + 2 \sin\left(\frac{1^2}{5}\right) + 2 \sin\left(\frac{2^2}{5}\right) + 2 \sin\left(\frac{3^2}{5}\right) + 2 \sin\left(\frac{4^2}{5}\right) + \sin(1) \right) = 0.313 \text{ or } 0.314$$

Example 6 – Estimating Integrals from Numerical Data

The velocity (in miles per hour) of a Piper Cub aircraft traveling due west is recorded every minute during the first 10 min after takeoff. Use the Trapezoidal Rule ~~and Simpson's Rule~~ to estimate the distance traveled after 10 min.

t	0	1	2	3	4	5	6	7	8	9	10
V(t)	0	50	60	80	90	100	95	85	80	75	85

$$\frac{1}{2} \cdot 1 \left(0 + 100 + 120 + 160 + 180 + 200 + 190 + 170 + 160 + 150 + 15 \right) = 757,5$$

$$\frac{757,5}{60} = 12,625 \text{ miles}$$

$$\begin{array}{r} p. 424 \\ \hline 2, 4, 9 \end{array}$$

Trapezoidal Rule

$$\frac{1}{2} \cdot \text{width} (y_0 + 2y_1 + 2y_2 + \dots + 2y_{n-1} + y_n)$$

Note: width must be a constant