7.1 examples

Wednesday, January 9, 2019 9:53 AM

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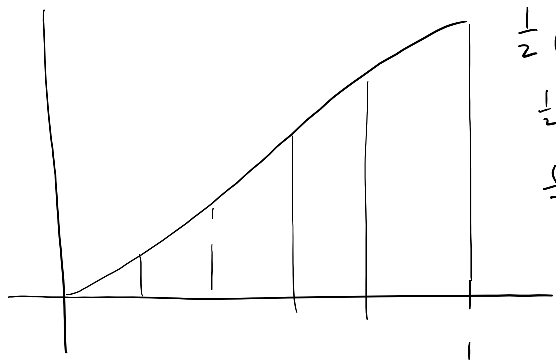
Calculus AB – Trapezoidal Rule (section 7.1)

Example 1

Area $= \frac{1}{2}(a+b)\cdot h$

Calculate the ~~tenth~~ 5TH trapezoidal approximation to $\int_0^1 \sin(x^2)\,dx$.



$\frac{1}{2}(\sin 0^2 + \sin(0.2)^2)\cdot\frac{1}{5} +$

$\frac{1}{2}(\sin 0.2^2 + \sin 0.4^2)\cdot\frac{1}{5} +$

$\frac{1}{2}(\sin 0.4^2 + \sin 0.6^2)\cdot\frac{1}{5} +$

$\frac{1}{2}(\sin 0.6^2 + \sin 0.8^2)\cdot\frac{1}{5} +$

$\frac{1}{2}(\sin 0.8^2 + \sin 1^2)\cdot\frac{1}{5}$

$$\frac{1}{2}\cdot\frac{1}{5}\left(\sin 0^2 + 2\sin 0.2^2 + 2\sin 0.4^2 + 2\sin 0.6^2 + 2\sin 0.8^2 + \sin 1^2\right)$$

$$\frac{1}{2}\cdot \text{width}\left(f(x_0) + 2f(x_1) + \dots + 2f(x_{n-1}) + f(x_n)\right)$$

TRAPEZOIDAL RULE
(useful only if width is constant)

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.

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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

$\frac{1}{2}\cdot 1\,(0 + 2(50) + 2(60) + 2(80) + 2(90) + 2(100)$

$$\frac{1}{2}\cdot 1\Big(0 + 2(50) + 2(60) + 2(80) + 2(90) + 2(100)$$
$$+ 2(95) + 2(85) + 2(80) + 2(75) + 85\Big)$$

divide by 60 $\rightarrow$ miles