5-1 Reimann Sums

Learning Target:

I can approximate the area under a curve using any of the Rectangle Approximation Methods or the Trapezoid Method.
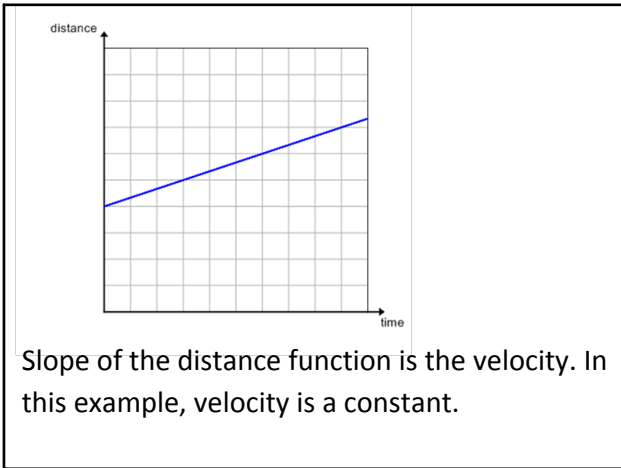
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Example: Suppose a car traveled at a steady rate of 65 miles per hour for 3 hours. What is the total distance traveled by the car?
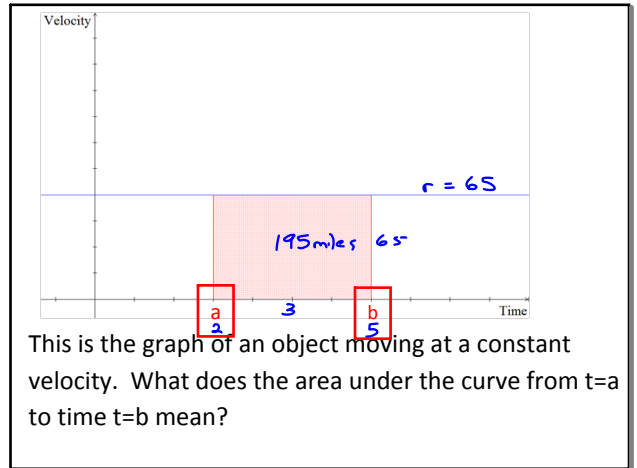
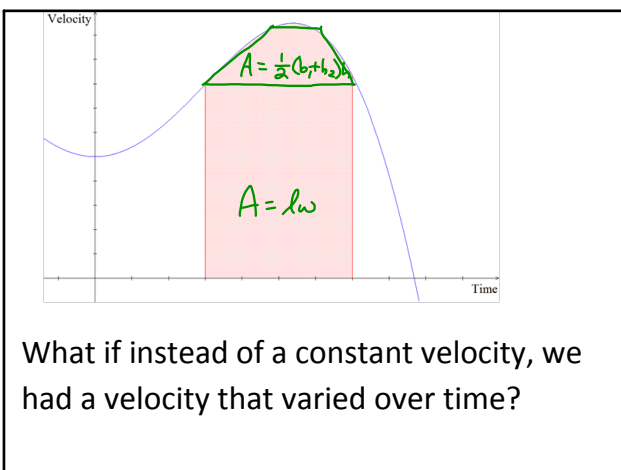$$65 \times 3 = 195 \text{ miles}$$
$$d = rt$$
$$d = 65t$$

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Slope of the distance function is the velocity. In this example, velocity is a constant.

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This is the graph of an object moving at a constant velocity. What does the area under the curve from t=a to time t=b mean?

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What if instead of a constant velocity, we had a velocity that varied over time?

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LRAM

Left

Rectangle Approximation Method

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RRAM

Right

Rectangle Approximaon Method

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MRAM

Midpoint Rectangle Approximaon
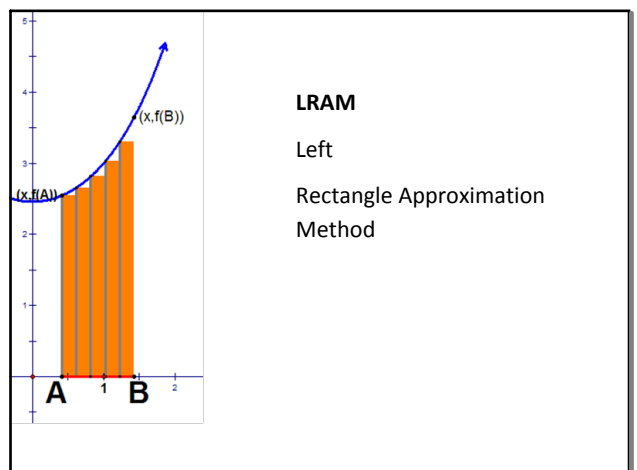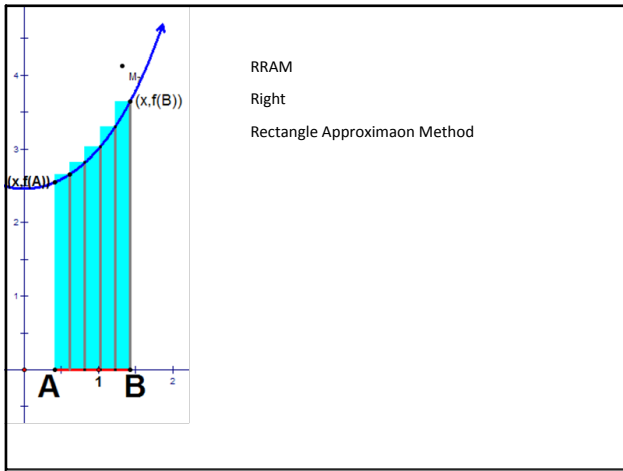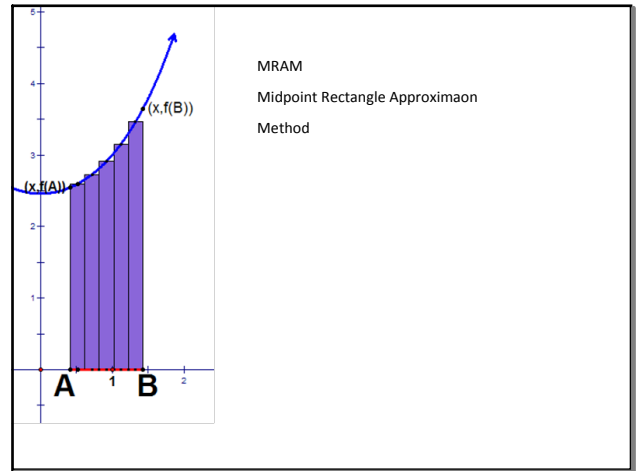
Method

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Ex1. Estimate the area under each curve using all 3 methods using 6 equal intervals

LRAM

$f(x)=x^2\sin x$ over $[1,3]$

$A = \ell w$

$A = \frac{1}{3}(f(1)) + \frac{1}{3}\cdot f(\frac{4}{3}) + \frac{1}{3}f(\frac{5}{3}) + \frac{1}{3}\cdot f(2) + \frac{1}{3}f(\frac{7}{3}) + \frac{1}{3}f(\frac{8}{3}) = 5.387 \text{ units}$

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RRAM

$f(x)=x^2\sin x$ over $[1,3]$

$A = \ell w$

① $\frac{1}{3}\cdot f(\frac{4}{3}) = \frac{1}{3}\cdot(\frac{4}{3})^2\sin(\frac{4}{3})$

② $\frac{1}{3}\cdot f(\frac{5}{3}) =$

③ $\frac{1}{3}\cdot f(2)$ 5.530 units^2

④ $\frac{1}{3}\cdot f(\frac{7}{3})$

⑤ $\frac{1}{3}\cdot f(\frac{8}{3})$

⑥ $\frac{1}{3}\cdot f(3)$

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MRAM

$f(x)=x^2\sin x$ over $[1,3]$

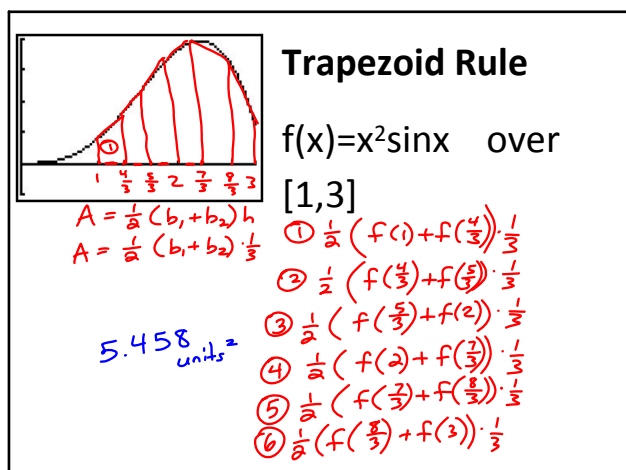① $\frac{1}{3}f(\frac{7}{6})$

② 5.601 units^2

③

④

⑤

⑥

$1 \quad \frac{4}{3}$

$\frac{6}{6} \quad \frac{8}{6}$

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Trapezoid Rule

Trapezoid

Approximaon Method

$A = \frac{1}{2}(b_1 + b_2)\cdot h$

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Trapezoid Rule

$f(x)=x^2\sin x$ over $[1,3]$

$A = \frac{1}{2}(b_1+b_2)h$

$A = \frac{1}{2}(b_1+b_2)\cdot\frac{1}{3}$

5.458 units²

① $\frac{1}{2}\left(f(1)+f\left(\frac{4}{3}\right)\right)\cdot\frac{1}{3}$

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

③ $\frac{1}{2}\left(f\left(\frac{5}{3}\right)+f(2)\right)\cdot\frac{1}{3}$

④ $\frac{1}{2}\left(f(2)+f\left(\frac{7}{3}\right)\right)\cdot\frac{1}{3}$

⑤ $\frac{1}{2}\left(f\left(\frac{7}{3}\right)+f\left(\frac{8}{3}\right)\right)\cdot\frac{1}{3}$

⑥ $\frac{1}{2}\left(f\left(\frac{8}{3}\right)+f(3)\right)\cdot\frac{1}{3}$

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Homework

Pg 270 # 9-12, 16, 18, 28

#9 LRAM   #10 RRAM

#11 MRAM   #12 Trap

6 sub-intervals

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