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Riemann Sums

Name ______________________________

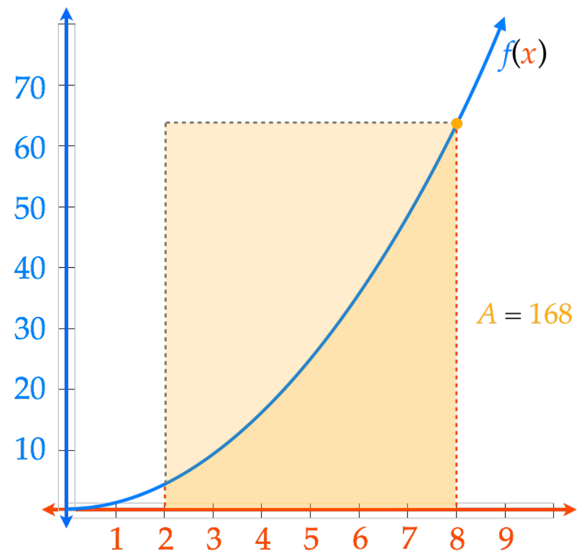
Date __________________ Period ______

Estimate the Area under $f(x) = x^2$ on $[2,8]$

Using Right Endpoints:

Let $n = 1$; $A = 384$

Area $= \Delta x \cdot f(x)$



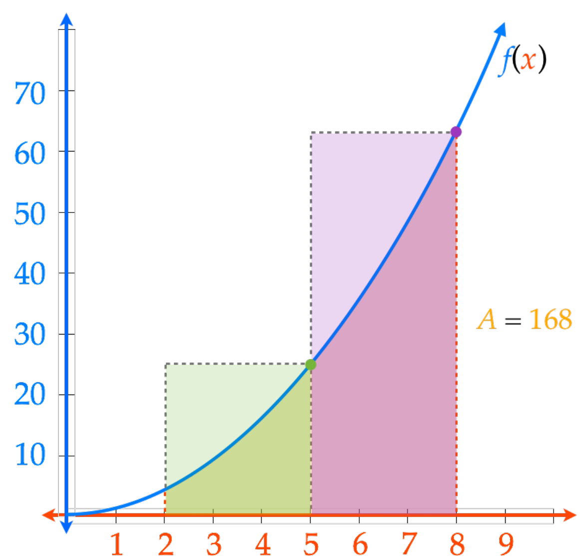
Estimate the Area under $f(x) = x^2$ on $[2,8]$

Using Right Endpoints:

Let $n = 1$; $A = 384$

Let $n = 2$; $A = 267$

Area $= \Delta x[f(x_1) + f(x_2)]$



Estimate the Area under $f(x) = x^2$ on [2,8]

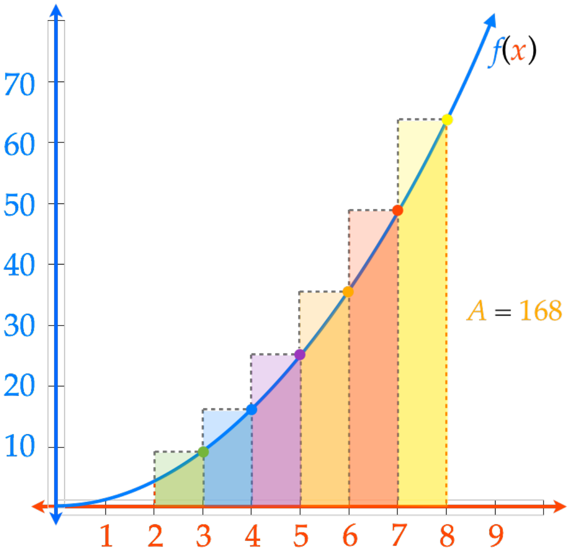
Using Right Endpoints:

Let $n = 1$; $A = 384$

Let $n = 2$; $A = 267$

Let $n = 6$; $A = 199$

Area = $\Delta x[f(x_1) + f(x_2) + f(x_3) + f(x_4) + f(x_5) + f(x_6)]$



Estimate the Area under $f(x) = x^2$ on [2,8]

Using Right Endpoints:

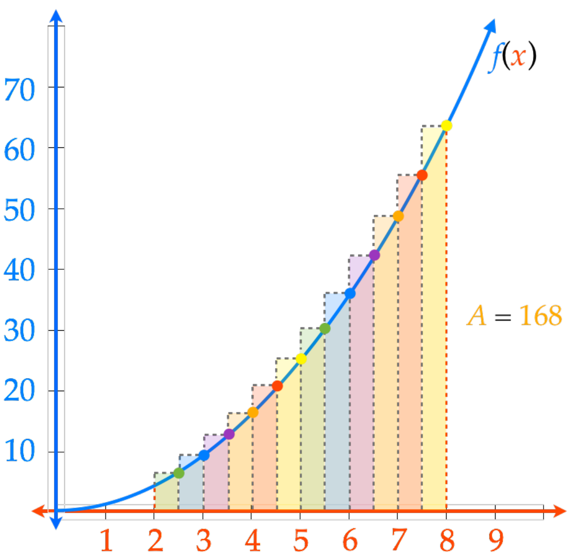
Let $n = 1$; $A = 384$

Let $n = 2$; $A = 267$

Let $n = 6$; $A = 199$

Let $n = 12$; $A = 183.25$

Area = $\Delta x[f(x_1) + f(x_2) + \ldots. + f(x_{11}) + f(x_{12})]$



Estimate the Area under $f(x) = x^2$ on [2,8]

Using Right Endpoints:

Let $n = 1$; $A = 384$

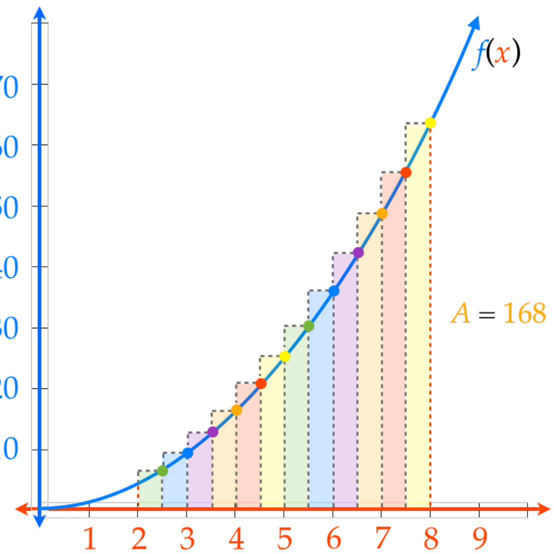
Let $n = 2$; $A = 267$

Let $n = 6$; $A = 199$

Let $n = 12$; $A = 183.25$

Let $n = 24$; $A = 170.56$

Area = $\Delta x[f(x_1) + f(x_2) + \ldots + f(x_{23}) + f(x_{24})]$



Estimate the Area under $f(x) = x^2$ on [2,8]

Using Right Endpoints:

Let $n = 1$; $A = 384$

Let $n = 2$; $A = 267$

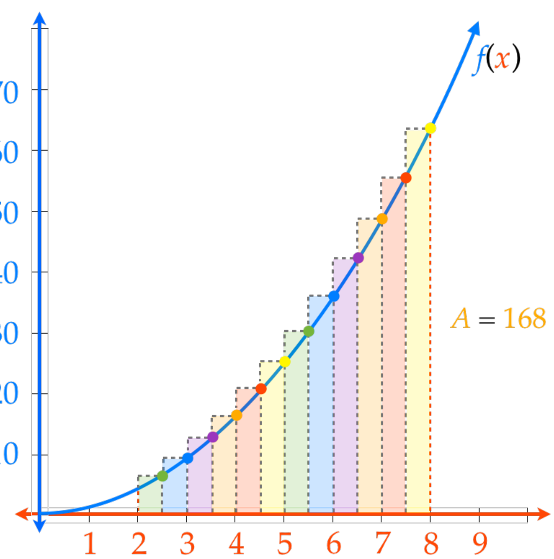
Let $n = 6$; $A = 199$

Let $n = 12$; $A = 183.25$

Let $n = 24$; $A = 170.56$

Let $n = 40$; $A = ?$

Area = $\Delta x[f(x_1) + f(x_2) + \ldots + f(x_{39}) + f(x_{40})]$



Estimate the Area under $f(x) = x^2$ on $[2,8]$

Using Right Endpoints:

Let $n = 1$; $A = 384$

Let $n = 2$; $A = 267$

Let $n = 6$; $A = 199$

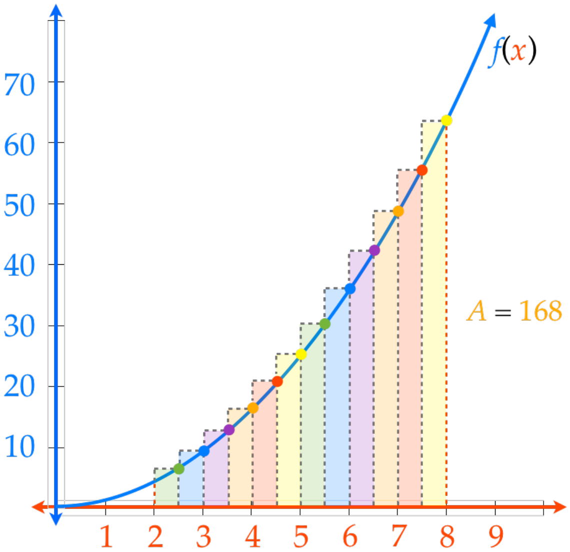
Let $n = 12$; $A = 183.25$

Let $n = 24$; $A = 170.56$

Let $n = 40$; $A = ?$

Let $n = 400$; $A = ?$

Let $n = 4000$; $A = ?$



Reimann Sum

Let f be defined on $[a,b]$ divided into n subintervals of length Δx.
If x_i is a point in the i^{th} subinterval, then

$$S = \sum_{i=1}^{n} \underbrace{f(x_i)}_{\text{height}} \cdot \underbrace{\Delta x}_{\text{width}} = \Delta x \cdot \sum_{i=1}^{n} f(x_i)$$

Let $n = 6$; Sum $= \Delta x[f(x_1) + f(x_2) + f(x_3) + f(x_4) + f(x_5) + f(x_6)]$

Let $n = 12$; Sum $= \Delta x[f(x_1) + f(x_2) + \ldots + f(x_{11}) + f(x_{12})]$

Let $n = 400$; Sum $= \Delta x[f(x_1) + f(x_2) + \ldots + f(x_{399}) + f(x_{400})]$

Reimann Sum

Let f be defined on $[a,b]$ divided into n subintervals of length Δx.
If x_i is a point in the i^{th} subinterval, then

$$S = \sum_{i=1}^{n} \overbrace{f(x_i)}^{\text{height}} \cdot \overbrace{\Delta x}^{\text{width}} = \Delta x \cdot \sum_{i=1}^{n} f(x_i)$$

$$\Delta x = \frac{b-a}{n}$$

Defining x_i:
- R.E. $x_i = a + i \cdot \Delta x$ <= Easiest to work with
- L.E. $x_i = a + (i-1)\Delta x$
- M.P. $x_i = a + (i-0.5)\Delta x$

When n is really large, doesn't matter which x_i is used. Use Right Endpoint.

Find S (Riemann Sum) for $f(x) = x^2$ on $[0,8]$ for n subintervals.

1) Define Δx 2) Define x_i 3) Define $f(x_i)$

$$S = \sum_{i=1}^{n} f(x_i) \cdot \Delta x$$

$$\Delta x = \frac{b-a}{n} \qquad x_i = a + i \cdot \Delta x$$

Find S (Riemann Sum) for $f(x) = 2x^3$ on $[0,5]$ for n subintervals.

1) Define Δx 2) Define x_i 3) Define $f(x_i)$

$$S = \sum_{i=1}^{n} f(x_i) \cdot \Delta x$$

$$\Delta x = \frac{b-a}{n} \qquad x_i = a + i \cdot \Delta x$$

Find S (Riemann Sum) for $f(x) = 3x^2$ on $[0,6]$ for n subintervals.

1) Define Δx 2) Define x_i 3) Define $f(x_i)$

$$S = \sum_{i=1}^{n} f(x_i) \cdot \Delta x$$

$$\Delta x = \frac{b-a}{n} \qquad x_i = a + i \cdot \Delta x$$