Readings of the power being used at a given time are taken at hourly intervals at an electric substation. The units of power are in kilowatts (kW) and the hourly readings over a 12-hour period are shown below.

$\Delta x = 2$ $\Delta x = 2$ $\Delta x = 2$ $\Delta x = 2$

t (hours)	0	1	2	3	4	5	6	7	8	9	10	11	12
$f(t)$ (kW)	900	1200	1300	1200	1000	850	1200	1000	1100	1400	1400	1700	1500
					L	M	L	M	L R	M	R	M	R

$\Delta x = \frac{b-a}{n} = \frac{12-4}{4} = \frac{8}{4} = 2$

a) Using a left sum approximation with 4 equally spaced subintervals, approximate the power usage from time $t = 4$ to $t = 12$.

left sum = 2(1000) + 2(1200) + 2(1100) + 2(1400)

= 9400 hr(kW)

= 9400 kWh

b) Using a right sum approximation with 4 equally spaced subintervals, approximate the power usage from time $t = 4$ to $t = 12$.

right sum = 2(1500) + 2(1400) + 2(1100) + 2(1200)

= 10400 kWh

c) Using a midpoint approximation with 4 equally spaced subintervals, approximate the power usage from time $t = 4$ to $t = 12$.

midpoint sum = 2(850) + 2(1000) + 2(1400) + 2(1700)

= 9900 kWh

DATE: _____

AP Riemann Problems

$\Delta x = \frac{9-1}{4} = \frac{8}{4} = 2$

x	1	3	5	7	9
$h(x)$	2	3	3	4	5

M M

1. Using the table of values shown above for the continuous function $h(x)$, which of the following is the approximation of the area under the curve $h(x)$ using left sum with 4 equal subintervals?

(A) 34 (B) 30 (C) 28 (D) 27 **(E) 24**

left sum = $2(2) + 2(3) + 2(3) + 2(4)$
$= 4 + 6 + 6 + 8$
$= 24$

2. Using the table of values shown above for the continuous function $h(x)$, which of the following is the approximation of the area under the curve $h(x)$ using right sum with 4 equal subintervals?

(A) 34 **(B) 30** (C) 28 (D) 27 (E) 24

$\Delta x = \frac{9-1}{4} = \frac{8}{4} = 2$

right sum = $2(5) + 2(4) + 2(3) + 2(3)$
$= 10 + 8 + 6 + 6 = 30$

3. Using the table of values shown above for the continuous function $h(x)$, which of the following is the approximation of the area under the curve $h(x)$ using midpoint sum with 2 equal subintervals?

(A) 34 (B) 30 **(C) 28** (D) 27 (E) 24

$\Delta x = \frac{9-1}{2} = \frac{8}{2} = 4$

midpoint sum = $4(3) + 4(4)$
$= 12 + 16 = 28$

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4. A function f is continuous on [1,5] and some of the values of f are shown below:

$\Delta x = 3$ $\Delta x = 1$

x	1	4	5
$f(x)$	7	b	2

not equal intervals.

If the right Riemann sum is 17, then the value of b is:

(A) –4 (B) 0 (C) 3 (D) 4.25 **(E) 5**

right sum = $\Delta x \cdot f(5) + \Delta x \cdot f(4)$
$17 = 1 \cdot 2 + 3 \cdot b$
$17 = 2 + 3b$
$15 = 3b$
$5 = b$