Big 10: Riemann Sums

Instructions: In the box below are the numbers 0 – 9. Complete the following and cross off the number for each answer. If you complete all problems correctly, you will cross off each number exactly once!

0	1	2	3	4	5	6	7	8	9

a. Given that $\int_1^6 x^3 dx = \lim_{n\to\infty} \sum_{i=1}^{n} \left(1+\frac{bi}{n}\right)^3 \frac{c}{n}$. Find $c-b$.

Use the table below to answer problems b and c

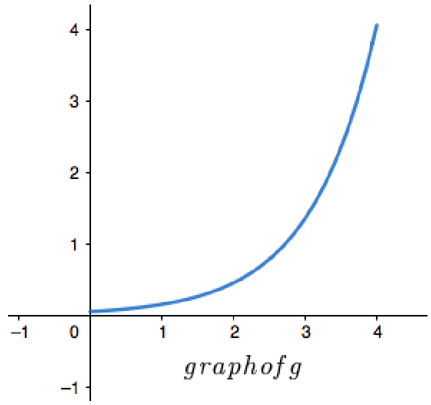
x	1	2	4	7	8
$f(x)$	4	-2	1	5	-9

b. Use a left Riemann Sum with the four subintervals indicated by the data in the table to approximate $\int_1^8 f(x)dx$

c. Use a right Riemann Sum with the four subintervals indicated by the data in the table to approximate $\int_1^8 f(x)dx$

t	0	1	3	7	8
$v(t)$	0	2	0.5	-1	2

d. The velocity of a particle, in meters per second, is given in the table above for selected times (in seconds). Use a left Riemann Sum with the four subintervals indicated in the table to approximate the total distance the particle travels, in meters, over the eight seconds.



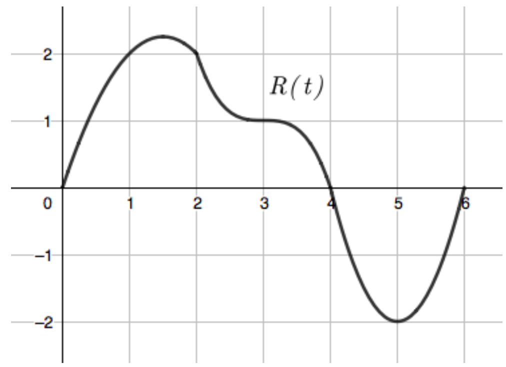
e. The graph of the function g is shown above for $0 \le x \le 4$. Of the following, which has the greatest value?

1. $\int_0^4 g(x)dx$
2. Left Riemann Sum approximation of $\int_0^4 g(x)dx$ with 4 subintervals of equal length
3. Right Riemann Sum approximation of $\int_0^4 g(x)dx$ with 4 subintervals of equal length
4. Midpoint Riemann Sum approximation of $\int_0^4 g(x)dx$ with 4 subintervals of equal length
5. Trapezoidal Sum approximation of $\int_0^4 g(x)dx$ with 4 subintervals of equal length

f. It is known that $\lim_{n\to\infty} \sum_{k=1}^{n} \sqrt{\frac{2k}{n}+1} \cdot \frac{1}{n}$ is equivalent to the expression $\int_1^2 \sqrt{ax+b}\,dx$. Find $a+b$.

t	0	1	2	3	4
$h(t)$	0.25	1	1.25	2.75	3

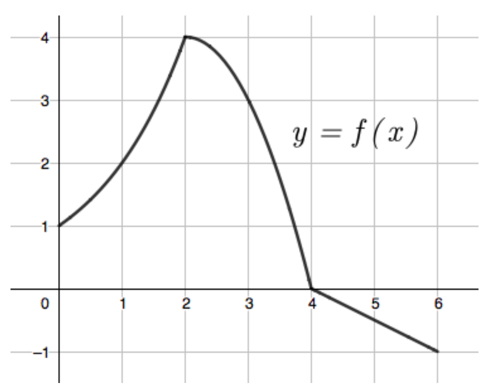
g. Water is slowly poured into an empty glass. The height of the water, measured in inches, is recorded at selected times, in seconds, in the table above. Use a right Riemann Sum with four subintervals of equal length indicated by the data in the table to approximate the value of $\frac{1}{4}\int_0^4 h(t)dt$



h. The rate, in hundreds of people per hour, that the amount of people in an amusement park is changing is modeled by the function $R(t)$ above where $t = 0$ corresponds to $12PM$. If there are 300 people in the park at 12PM, use a midpoint Riemann Sum with three equal subintervals to approximate the total number of people, in hundreds, in the park at 6PM.

x	0	1	2	4	6
$g(x)$	1	1.5	0.5	0.25	0.75

j. Use a trapezoidal approximation with 4 subintervals indicated by the data in the table above to approximate $\int_0^6 g(x)dx$



k. The graph of $f(x)$ *is* above. use a midpoint Riemann Sum with three equal subintervals to approximate $\int_0^6 f(x)dx$