Math 1108 All Sections Spring 00, WS#3C. Flow/Amount Name.________
The tables at the back of your book may be needed. See Flow/Amount Handout.

1. The rate of flow of water in a tidal river is $r(t)=60+20\sin(\pi t/6)$ in 100 m^3/min., measured at the Merrimac River breakwater, t hours after 8 AM on May 1, 2000. Determine
A. The net amount of water that flows out of the river between 8 AM and 2 PM. (Set up an integral, then evaluate it).
B. The average rate of water flow in that period.
C. If the river water contains suspended silt, of density 5t kg/100 m^3, t hours after 8 AM, determine the total amount of silt that flows past the breakwater in the same time period.
D. How do your answers change if you consider the period 8 AM-8PM?
How much water flows out in the period 8AM-2PM? How much flows in in the period 2PM-8PM?

2. Following is a table of data for the rate of flow of blood in a capillary.

t (seconds)	0	0.3	0.6	0.9	1.2
flow in ml/sec	2	5	9	4	1

2A. Use a trapezoid sum T(4) to estimate the total amount of blood that flows throught the capillary in 1.2 secs.
2B. If the blood carries $f(t)=(12-10t)$ mg/liter of $C0_2$, at time t seconds, how much CO_2 passes through the capillary in the first 1.2 seconds? (Use Simpson's rule S(4) or a Riemann sum T(4) to estimate the answer).

3A. The flow of water across a small dam is (100+ 50t) m^3/hour, t hours after the start of a tropical storm. What is the total flow of water in the first 3 hours? (Set up, and evaluate integral).
3B. If the water contains .07t grams of silt/m^3, t hours after the start of flow, how much silt flows across the dam in the first t hours?

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Riemann sum formulas for $\int_a^b f(x)dx$, using n equal subdivisions: $\Delta x=(b-a)/n$
L(n) = $(\Delta x)(h_0+h_1+h_2+h_3+\ldots+h_{n-1})$ (left); R(n)= $(\Delta x)(h_1+h_2+h_3+\ldots+h_{n-1}+h_n)$ (right)
T(n) = $(\Delta x)(0.5h_0+h_1+h_2+h_3+\ldots+h_{n-1}+0.5h_n)$ = trapezoid
Note: T(n)=(L(n)+R(n))/2, the average of left and right sums.
S(n)= $(\frac{\Delta x}{3})(1h_0+4h_1+2h_2+4h_3+\ldots+4h_{n-1}+1h_n)$, Simpson's: (n must be even)
Here $h_0=f(a),\ h_1=f(a+\Delta x),\ldots,\ h_i=f(a+i\Delta x),\ldots,\ h_n=f(b)$. (the values of f at n+1 equally spaced points.)