Lesson #79 HW Name______________________

Midpoint/Trapezoid Rule

You may use a calculator on this worksheet after you set up the problems.

1. The rate at which water flows out of a pipe, in gallons per hour, is given by a differentiable function $R(t)$. The table below shows the rate as measured every 3 hours for a 24-hour period.

   A) Use a midpoint Riemann sum with 4 subdivisions of equal length to approximate $\int_0^{24} R(t)dt$.

t (hours)	$R(t)$ (gallons per hour)
0	9.6
3	10.4
6	10.8
9	11.2
12	11.4
15	11.3
18	10.7
21	10.2
24	9.6

   B) Using correct units, explain the meaning of your answer in terms of water flow.

2. Selected values of the velocity, $v(t)$, in ft/sec, of a car travelling on a straight road for $0 \le t \le 50$ are listed in the table below.

   A) Approximate $\int_0^{50} v(t)dt$ with a Riemann sum using the midpoints of five subintervals of equal length.

t (seconds)	$v(t)$ (feet per second)
0	0
5	12
10	20
15	30
20	55
25	70
30	78
35	81
40	75
45	60
50	72

   B) Approximate $\int_0^{50} v(t)dt$ with a trapezoidal sum using five subintervals of equal length.

3. Use a midpoint Riemann sum with 6 subintervals of equal length to approximate $\int_2^5 \sqrt{x-1}dx$.

4. Use a trapezoidal sum with 6 subintervals of equal length to approximate $\int_1^4 \frac{1}{\sqrt{x}}dx$.

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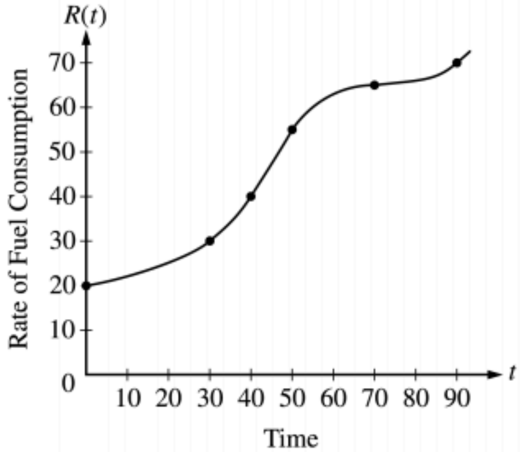

t (minutes)	$R(t)$ (gallons per minute)
0	20
30	30
40	40
50	55
70	65
90	70

5.

The rate of fuel consumption, in gallons per minute, recorded during an airplane flight is given by a twice-differentiable and strictly increasing function R of time t. The graph of R and a table of selected values of $R(t)$, for the time interval $0 \le t \le 90$ minutes, are shown above.

A) Approximate the value of $\int_0^{90} R(t)dt$ using a trapezoidal approximation with the five subintervals indicated in the table.

B) For $0 < b \le 90$, explain the meaning of $\frac{1}{b}\int_0^{b} R(t)dt$ in terms of fuel consumption for the plane, using correct units.

6.

Distance x (cm)	0	1	5	6	8
Temperature $T(x)$ (°C)	100	93	70	62	55

A metal wire of length 8 centimeters (cm) is heated at one end. The table above gives selected values of the temperature $T(x)$, in degrees Celsius (°C), of the wire x cm from the heated end. The function T is decreasing and twice differentiable.

(a) Estimate $T'(7)$. Show the work that leads to your answer. Indicate units of measure.

(b) Write an integral expression in terms of $T(x)$ for the average temperature of the wire. Estimate the average temperature of the wire using a trapezoidal sum with the four subintervals indicated by the data in the table. Indicate units of measure.