

**Show all work. You can use a calculator but many of these problems can be done without it.**

**Use Riemann's Rule with TRAPEZOIDAL sum to approximate the value of the definite integral for the given value. Round answer to four decimal places. Do this work on a separate sheet of paper.**

1)  $\int_0^2 x^2 dx, n = 4$

2)  $\int_1^4 (4 - x^2) dx, n = 6$

3) Given the definite integral,  $g(x) = \int_{-1}^2 (20 - x^4) dx$

(a) Use Trapezoidal Rule with three equal subintervals to approximate its value. Do not use your calculator.

(b) Is the answer to part (a) an overestimate or an underestimate? Justify your answer.

4) A table of a values for  $f(t)$  is given.

$t$	0	20	40	60	80	100	120
$f(t)$	1.2	2.8	4.0	4.7	5.1	5.2	4.8

(a) Left-Hand Riemann; 6 subintervals

(b) Midpoint Riemann; 3 subintervals

(c) Trapezoidal Riemann; 3 subintervals

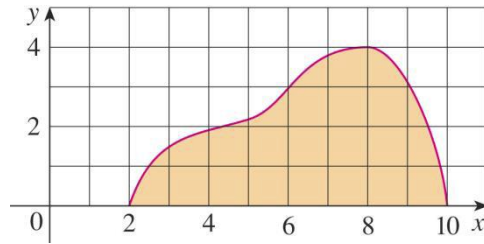
5) A table of a values for  $g(t)$  is given.

$t$	0	40	70	90	100
$f(t)$	150	180	195	184	172

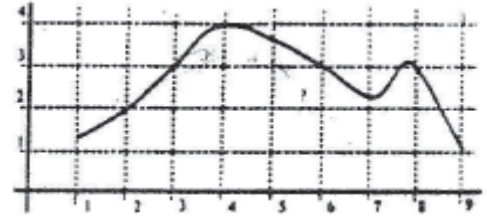
(a) Right-Hand Riemann; 4 subintervals

(b) Trapezoidal Riemann; 4 subintervals

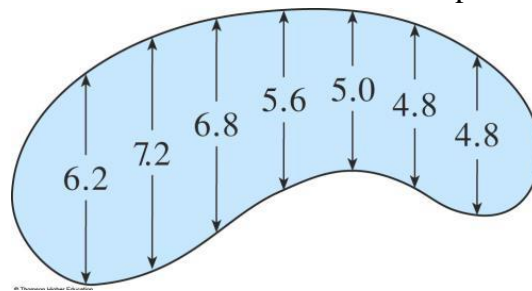
- 6) Estimate the area under the graph in the figure below by using the Trapezoidal rule with eight equal subintervals



- 7) The graph of  $f$  over the interval  $[1,9]$  is shown. Using the data from the graph, find the trapezoidal rule estimates for the integral  $\int_1^9 f(x) dx$  with 4 equal subintervals.



- 8) The widths (in meters) of a kidney-shape swimming pool were measured at 2-meter intervals as indicated in the figure below. Use a trapezoidal rule to estimate the area of the pool.



- 9) A metal wire of length 8 centimeters is heated at one end. The table below gives selected values of the temperature  $T(x)$ , in degrees Celsius, of the wire  $x$  cm from the heated end.

Distance $x$ (cm)	0	1	5	6	8
Temperature $T(x)$ ( $^{\circ}\text{C}$ )	100	93	70	62	55

- (a) Estimate  $T'(7)$ . Show the work that leads to your answer. Indicate units of measure.
- (b) Write an integral expression in terms of  $T(x)$  using a trapezoidal sum with the four subintervals indicated by the data in the table. Indicate units of measure.

**KEY**

- 1)  $\frac{11}{4}$  units<sup>2</sup>      2)  $-9.125$  units<sup>2</sup>      3a) 50.5 units<sup>2</sup>      3b) Underestimate because  $g$  is decreasing
- 4a) 460 units<sup>2</sup>      4b) 508 units<sup>2</sup>      4c) 484 units<sup>2</sup>      5a) 18,450 units<sup>2</sup>
- 5b) 17,795 units<sup>2</sup>      6) 19 units<sup>2</sup>      7) 20 units<sup>2</sup>      8) 80.8 units<sup>2</sup>
- 9a)  $-\frac{7}{2}$  degrees C/min      9b) 605.5 units<sup>2</sup>