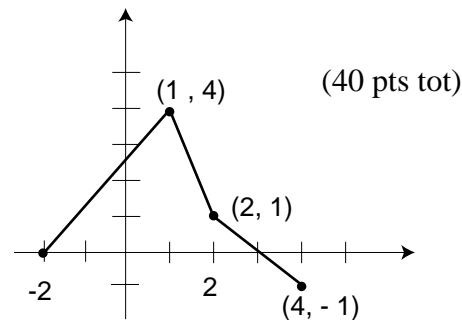


Chapters 7 & 8 Exam

I The graph of the function f , consisting of three line segments, is given:



Let $g(x) = \int_1^x f(t) dt$.

- Compute $g(4)$, $g(-2)$. Be very clear.
- Find $g'(1)$.
- Find the coordinates of and identify all extreme values of g on the closed interval $[-2, 4]$. Justify your answer.
- Explain how you know the second derivative of g is not defined at $x = 1$ and $x = 2$.
- Which (if any) of the values $x = 1$ and $x = 2$ the x -coordinates of points of inflection of the graph of g ? Justify your answer.

II The rate at which water flows out of a pipe, in gallons per hour, is given by a differentiable function R of time t . The table shows the rate as measured every 3 hours for a 24-hour period. (40 pts tot)

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

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

- Is there some time t , $0 < t < 24$, such that $R'(t) = 0$? Justify your answer.
- The rate of water flow $R(t)$ can be approximated by

$Q(t) = \frac{1}{79}(768 + 23t - t^2)$. Use $Q(t)$ to approximate the average rate of water flow during the 24-hour time period. Indicate units of measure.

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

III The definite integral of a function f over an interval $[a, b]$ is denoted by $\int f(x) dx$ and defined

as follows: $\int f(x) dx = \lim_{\text{mesh} \rightarrow 0} f(X_i)(x_i - x_{i-1})$.

Describe each of the following **and** its purpose: (20 pts tot)

- a) X_i b) $x_i - x_{i-1}$ c) $f(X_i)$ d) $f(X_i)(x_i - x_{i-1})$ e) mesh

Extra Credit ----- 5 pts -----

A speaker talked for sixty minutes to a full auditorium. Twenty percent of the audience heard the entire talk, and ten percent slept through the entire talk. Half the remainder heard one-third of the talk and the other half heard two-thirds of the talk. What was the average number of minutes of the talk heard by members of the audience?