


Put answers on a separate piece of paper. Label each Section. Show all work for Free Response questions.

## Quick Quiz for AP\* Preparation: Sections 5.1–5.3

 You should solve the following problems without using a calculator.

1. **Multiple Choice** If  $\int_a^b f(x) dx = a + 2b$ , then  $\int_a^b (f(x) + 3) dx =$
- (A)  $a + 2b + 3$  (B)  $3b - 3a$   
(C)  $4a - b$  (D)  $5b - 2a$   
(E)  $5b - 3a$

2. **Multiple Choice** The expression

$$\frac{1}{20} \left( \sqrt{\frac{1}{20}} + \sqrt{\frac{2}{20}} + \sqrt{\frac{3}{20}} + \cdots + \sqrt{\frac{20}{20}} \right)$$


is a Riemann sum approximation for

- (A)  $\int_0^1 \sqrt{\frac{x}{20}} dx$  (B)  $\int_0^1 \sqrt{x} dx$   
(C)  $\frac{1}{20} \int_0^1 \sqrt{\frac{x}{20}} dx$  (D)  $\frac{1}{20} \int_0^1 \sqrt{x} dx$   
(E)  $\frac{1}{20} \int_0^{20} \sqrt{x} dx$

3. **Multiple Choice** What are all values of  $k$  for which  $\int_2^k x^2 dx = 0$ ?
- (A)  $-2$  (B)  $0$  (C)  $2$   
(D)  $-2$  and  $2$  (E)  $-2, 0,$  and  $2$

4. **Free Response** Let  $f$  be a function such that  $f''(x) = 6x + 12$ .
- (a) Find  $f(x)$  if the graph of  $f$  is tangent to the line  $4x - y = 5$  at the point  $(0, -5)$ .
- (b) Find the average value of  $f(x)$  on the closed interval  $[-1, 1]$ .

## Quick Quiz for AP\* Preparation: Sections 5.4 and 5.5

 You may use a graphing calculator to solve the following problems.

1. **Multiple Choice** The function  $f$  is continuous on the closed interval  $[1, 7]$  and has values that are given in the table below.

$x$	1	4	6	7
$f(x)$	10	30	40	20

Using the subintervals  $[1, 4]$ ,  $[4, 6]$ , and  $[6, 7]$ , what is the trapezoidal approximation of  $\int_1^7 f(x) dx$ ?


- (A) 110 (B) 130 (C) 160 (D) 190 (E) 210
2. **Multiple Choice** Let  $F(x)$  be an antiderivative of  $\sin^3 x$ . If  $F(1) = 0$ , then  $F(8) =$
- (A) 0.00 (B) 0.021 (C) 0.373 (D) 0.632 (E) 0.968

3. **Multiple Choice** Let  $f(x) = \int_{-2}^{x^2-3x} e^{t^2} dt$ . At what value of  $x$  is  $f(x)$  a minimum?
- (A) For no value of  $x$  (B)  $\frac{1}{2}$  (C)  $\frac{3}{2}$  (D) 2 (E) 3

4. **Free Response** Let  $F(x) = \int_0^x \sin(t^2) dt$  for  $0 \leq x \leq 3$ .
- (a) Use the Trapezoidal Rule with four equal subdivisions of the closed interval  $[0, 2]$  to approximate  $F(2)$ .
- (b) On what interval or intervals is  $F$  increasing? Justify your answer.
- (c) If the average rate of change of  $F$  on the closed interval  $[0, 3]$  is  $k$ , find  $\int_0^3 \sin(t^2) dt$  in terms of  $k$ .

## Ch 5 Review Section

### AP \*Examination Preparation

 You may use a graphing calculator to solve the following problems.

58. The rate at which water flows out of a pipe is given by a differentiable function  $R$  of time  $t$ . The table below records the rate at 4-hour intervals for a 24-hour period.

$t$ (hours)	$R(t)$ (gallons per hour)
0	9.6
4	10.3
8	10.9
12	11.1
16	10.9
20	10.5
24	9.6

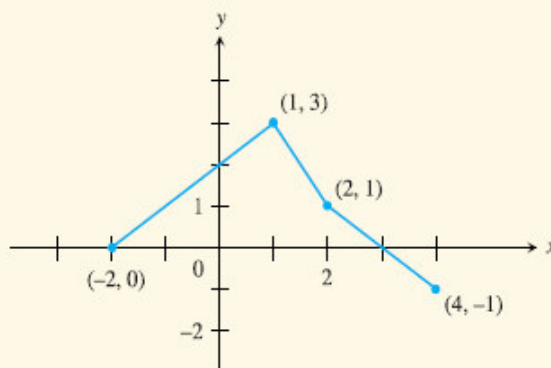
- (a) Use the Trapezoid Rule with 6 subdivisions of equal length to approximate  $\int_0^{24} R(t) dt$ . Explain the meaning of your answer in terms of water flow, using correct units.
- (b) Is there some time  $t$  between 0 and 24 such that  $R'(t) = 0$ ? Justify your answer.
- (c) Suppose the rate of water flow is approximated by  $Q(t) = 0.01(950 + 25t - t^2)$ . Use  $Q(t)$  to approximate the average rate of water flow during the 24-hour period. Indicate units of measure.

59. Let  $f$  be a differentiable function with the following properties.

i.  $f'(x) = ax^2 + bx$     ii.  $f'(1) = -6$  and  $f''(x) = 6$   
 iii.  $\int_1^2 f(x) dx = 14$

Find  $f(x)$ . Show your work.

60. The graph of the function  $f$ , consisting of three line segments, is shown below.



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

- (a) Compute  $g(4)$  and  $g(-2)$ .
- (b) Find the instantaneous rate of change of  $g$ , with respect to  $x$ , at  $x = 2$ .
- (c) Find the absolute minimum value of  $g$  on the closed interval  $[-2, 4]$ . Justify your answer.
- (d) The second derivative of  $g$  is not defined at  $x = 1$  and  $x = 2$ . Which of these values are  $x$ -coordinates of points of inflection of the graph of  $g$ ? Justify your answer.