

Name: _____ Date: _____

Mid-Unit 6 CA – Integration and Accumulation of Change

<p>1. Let $g(x) = \int_a^x f(t) dt$ with the graph of f shown above and a is a constant. Find the x-values of g regarding each of the following conditions.</p>		
a. Relative minimum(s)	b. Relative maximum(s)	
c. Concave up	d. Concave down	
e. Increasing	f. Decreasing	
g. Point(s) of inflection		
h. If $g(0) = -4$, what is the maximum value of g ?	i. Given $h(x) = \int_0^{3x+6} f(t) dt$. Find the x -value where h has a relative maximum.	

2. **Calculator active problem.** Particle A moves along a horizontal line with velocity $v(t)$, where $v(t)$ is a positive continuous function of t . The time t is measured in cm/sec. The velocity of the particle at selected times is given in the table.

t (sec)	0	2	5	7	10
$v(t)$ (cm/sec)	1.7	6.8	7.4	15.6	24.9

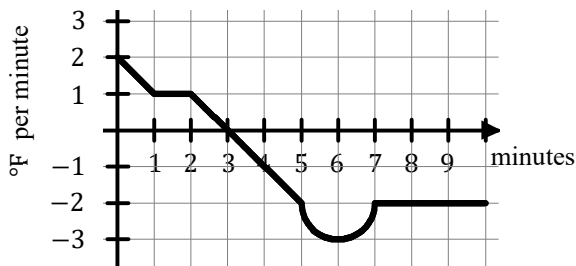
- a. Use the data from the table to approximate the distance traveled by a particle A over the interval $0 \leq t \leq 10$ seconds by using a left Riemann Sum with four subintervals. Show the computations that lead to your answer.

- b. Assuming that $v(t)$ is a continuous increasing function, is the approximation greater or less than the true value?

- c. Particle B moves along the same horizontal line with position $x(t) = te^{\sin(3t)}$ cm. Which particle is traveling faster at time $t = 5$? Explain your answer.

3. Given the definite integral $\int_{-3}^1 3x^2 dx$, write an equivalent expression using summation notation

4. The graph below shows the rate of change of the temperature of Mr. Brust's hot tub over 10 minutes.



After 10 minutes, how many degrees has the temperature changed from $t = 0$ minutes?

5. The expression $\frac{1}{8} \left(\sqrt{\frac{1}{8}} + \sqrt{\frac{2}{8}} + \sqrt{\frac{3}{8}} + \dots + \sqrt{\frac{8}{8}} \right)$ is a Riemann sum approximation of which of the following integrals?

- (A) $\int_0^1 \sqrt{\frac{x}{8}} dx$ (B) $\int_0^1 \sqrt{x} dx$ (C) $\frac{1}{8} \int_0^1 \sqrt{\frac{x}{8}} dx$ (D) $\frac{1}{8} \int_0^1 \sqrt{x} dx$ (E) $\frac{1}{8} \int_0^8 \sqrt{x} dx$

Find $F'(x)$.

6. $F(x) = \int_0^{\sin x} t^2 dt$

7. $F(x) = \int_1^{-3x} \ln t dt$

8. $F(x) = \int_{-4}^{7x} f(t) dt$

9. $F(x) = \int_{x^2}^{x+8} (3t - 8) dt$

10. Use a Trapezoidal approximation with 3 subintervals to approximate the area under $f(x) = x^2 + 2x + 4$ on the interval $[1, 7]$.

ANSWERS to Mid-Unit 5 Corrective Assignment

1a. none	1b. $x = 3$	1c. (5,6)	1d. (2,5)	1e. (0,3)
1f. (3,8)	1g. $x = 5$	1h. 1	1i. $x = -1$	2a. 85.4 cm
2b. The approximation is less than the true value because it is a left-Riemann sum on an increasing function.		2c. $x'(5) = -19.918$ Particle B is moving faster ≈ 20 cm/sec compared to Particle A's 7.4 cm/ sec		
3. $\lim_{n \rightarrow \infty} \sum_{k=1}^n 3 \left(\frac{4}{n}\right) \left(-3 + \frac{4k}{n}\right)^2$	4. $-9 - \frac{\pi}{2}$ degrees	5. (B) $\int_0^1 \sqrt{x} dx$	6. $\sin^2 x \cos x$	
7. $-3 \ln(-3x)$	8. $7 \cdot f(7x)$	9. $-6x^3 + 19x + 16$	10. 190	