Name _____ **Date** _____

AP Calculus BC

Integration Review

1. If $\int_1^{10} f(x)\,dx = 4$ and $\int_{10}^{3} f(x)\,dx = 7$, then $\int_1^3 f(x)\,dx =$

2. Evaluate each of the following integrals:

   a) $\int_0^{\frac{\pi}{3}} \sin(3x)\,dx =$

   b) $\int_0^4 (2x+1)^{1/2}\,dx$

   c) $\int_1^4 \frac{3}{x^2}\,dx$

   d) $\frac{1}{2}\int_{-6}^{0} e^{t/2}\,dt$

   e) $\int_1^2 \frac{x-4}{x^2}\,dx$

f) $\int_1^2 \frac{x^2-1}{x+1}\,dx =$

g) $\int_1^5 \frac{3}{x}dx =$

3. Find dy/dx for each of the following:

a) $f(x) = 8x - xsinx$

b) $g(x) = 5lnx - \frac{1}{2}x^3$

4. If $\int_0^k \left(2kx - x^2\right)dx = 18$, then $k =$

5. Find $\frac{d}{dx}\int_1^{x^2} \sqrt{1+t^3}dt.$

6. If $F(t) = \int_0^{2x} \cos(2\pi t)\, dt$, then $F'\left(\frac{1}{4}\right) =$

7. If $g(2) = 8$, where $g'(x)$ is continuous, $\int_{-3}^{2} g'(x) = 5$, and $\int_{2}^{7} g'(x) = 11$, find the value of $g(7)$ and $g(-3)$?

8. The acceleration of a particle at time $t > 0$ moving along the $x - axis$ is $a(t) = t(3t - 2)\ ft/min^2$. If at $t = 1$ seconds the velocity, $v(t) = 5$ m/sec and the position, $s(t) = 10$ m, then what is $s(2)$?

9. Evaluate the indefinite integral: $\int (x^3 - 3x)^2 dx$

10. Find the average value for each of the following over the given interval.

a) $g(x) = \frac{1}{x}$; [1,3]

b) $y = sec^2x$; $[0,\frac{\pi}{3}]$

11. A test plane flies in a straight line with positive velocity v(t), in miles per minute at time t minutes, where v is a differential function of t. Selected values of v(t) for $0 \leq t \leq 40$ are shown in the table below.

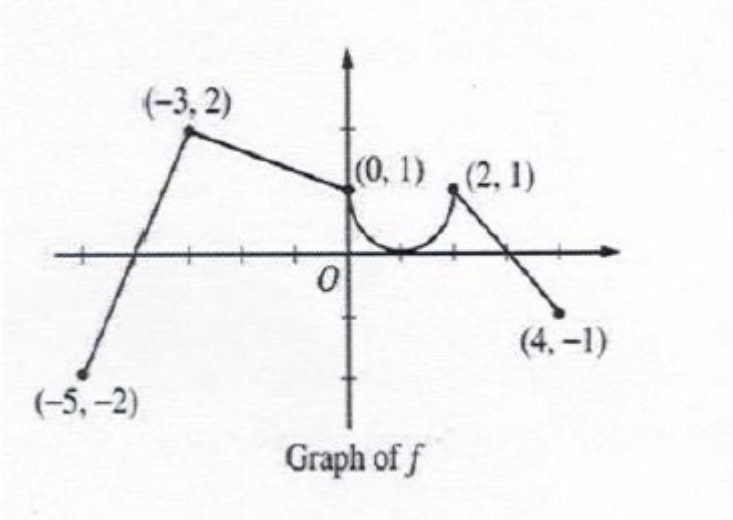
t (min)	0	5	10	15	20	25	30	35	40
$v(t)$ (mpm)	7.0	9.2	9.5	7.0	4.5	2.4	2.4	4.3	7.3

a. Use a midpoint Riemann sum with four subintervals of equal length and values from the table to approximate $\int_0^{40} v(t)dt$. Show the computations that lead to your answer. Using correct units explain the meaning of $\int_0^{40} v(t)dt$. in terms of the plane's flight.

12. The following table gives data from a two-hour trip. Use the table, with six equal subintervals, to get both a left and right Riemann sum approximations for the total distance traveled.

Time (min)	0	10	20	30	40	50	60	70	80	90	100	110	120
Speed(mph)	0	5	15	30	50	55	60	57	46	35	30	27	0

13.



Graph of f

The graph of the function f shown above consists of a semicircle and three line segments. Let g be the function given by $g(x) = \int_{-3}^{x} f(t)dt$.

a) Find $g(-5)$ and $g(4)$.

b) Find all the values of x in the open interval (-5,4) at which g attains a relative minimum and maximum. Justify your answer.

c) Find the absolute minimum and maximum values of g on the closed interval [-5,4]. Justify your answer.

Answer Key:

1) 11	2) a) $\frac{2}{3}$
b) $\frac{26}{3}$	c) $\frac{9}{4}$
d) $1-\frac{1}{e^3}$	e) $ln2-2$
f) $\frac{1}{2}$	g) $3ln5$
3) a) $8-sinx-xcosx$	b) $\frac{5}{x}-\frac{3}{2}x^2$
4) 3	5) $2x\sqrt{1+x^6}$
6) -2	7) $g(7)=19$; $g(-3)=3$
8) $\frac{197}{12}$	9) $\frac{x^7}{7}-\frac{6}{5}x^5+3x^3+C$
10) a) $\frac{1}{2}ln3$	b) $\frac{3\sqrt{3}}{\pi}$
11) 229 miles is the total distance that the test plane flies in 40 minutes.	12) left = 4020 ; right = 4020
13) a) $g(-5)=0$; $g(4)=\frac{13-\pi}{2}$	b) rel min at $x=-4$ with justification rel max at $x=3$ with justification
c) absolute min is -1 which occurs at $x=-4$ absolute max is $7-\frac{\pi}{2}$ which occurs at $x=3$	