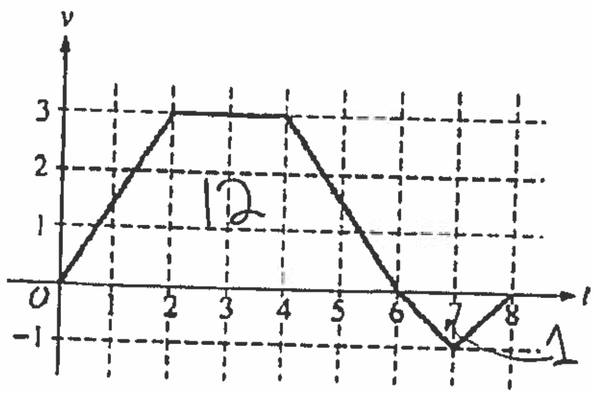
AP Questions 4.1 – 4.3

Name: Answer Key

1.



$A: \frac{1}{2}(6+2)(3)$

$\frac{1}{2}(8)(3)$

12

$A = \frac{1}{2}(2)(1)$

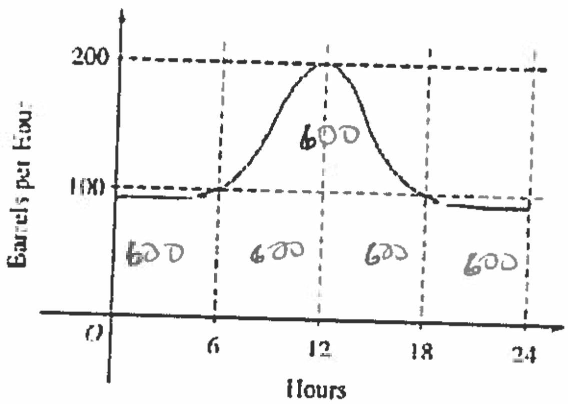
$A = 1$

A bug begins to crawl up a vertical wire at time t = 0. The velocity of the bug at time t, $0 \le t \le 8$, is given by the function whose graph is shown above.

What is the total distance the bug traveled from t = 0 to t = 8?

(A) 14 (B) 13 (C) 11 (D) 8 (E) 6

2.



The flow of oil, in barrels per hour, through a pipeline on July 9 is given by the graph shown above. Of the following, which best approximates, the total number of barrels of oil that passed through the pipeline that day?

(A) 500 (B) 600 (C) 2,400 (D) 3,000 (E) 4,800

3.

t (sec)	0	2	4	6
$a(t)$ (ft/sec^2)	5	2	8	3

C

$2(5) + 2(2) + 2(8) + 11$

$10 + 4 + 16 + 11$

41

The data for the acceleration a(t) of a car from 0 to 6 seconds are given in the table above. If the velocity at t = 0 is 11 feet per second, the approximate value of the velocity at t = 6, computed using a left-hand Riemann sum with three subintervals of equal length is

(A) 26 ft/sec (B) 30 ft/sec (C) 37 ft/sec (D) 39 ft/sec (E) 41 ft/sec

4. The graph of f ', the derivative of f, is the line shown in the figure to the right.

If f(0) = 5, then f(1) =

(A) 0

(B) 3

(C) 6

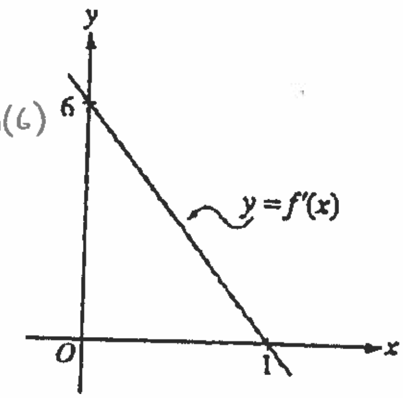
(D) 8

(E) 11

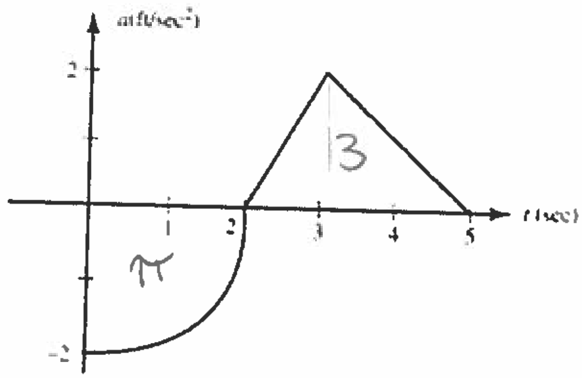
$3 + 5 = 8$

$A = \frac{1}{2}(1)(6)$

$A = 3$



5.



$A = \frac{1}{4}\pi r^2$

$A = \frac{1}{4}\pi(2)^2$

$A = \pi$

$A = \frac{1}{2}(2)(3)$

$A = 3$

$V_0 - \pi + 3 = 0$

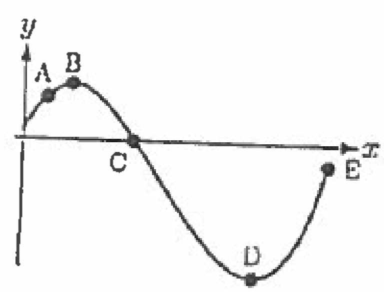
$V_0 = \pi - 3$

The graph above shows an object's acceleration (in ft/sec^2). It consists of a quarter-circle and two line segments. If the object was at rest at t = 5 seconds, what was its initial velocity?

(A) -2 ft/sec (B) $3 - \pi$ ft/sec (C) 0 ft/sec (D) $\pi - 3$ ft/sec (E) $\pi + 3$ ft/sec

Use the following figure for questions 6 – 7.

The figure to the right shows the velocity of a moving object as a function of time. The object is located at the origin for t = 0.



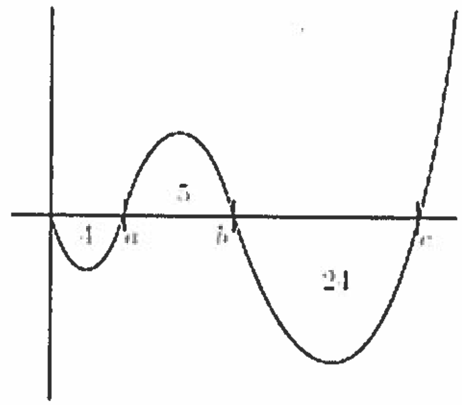
6) At which point is the object farthest to the right?

(A) A (B) B (C) C (D) D (E) E

7) At which point is the object farthest from the origin?

(A) A (B) B (C) C (D) D (E) E

8. A particle moves along the x-axis. Its initial position at t = 0 sec is x(0) = 15. The graph below shows the particle's velocity v(t). The numbers are areas of the enclosed figures.



(a) What is the particle's displacement between t = 0 and t = c? $-4+5-24 = -23$

(b) What is the total distance traveled by the particle in the same time period?

$4+5+24 = 33$

(c) Give the positions of the particle at times a, b, and c.

$a = 15-4 = 11$
$b = 15-4+5 = 16$
$c = 15-4+5-24 = -8$

(d) Approximately where does the particle achieve its greatest positive acceleration on the intervals [0, b] and [0, c]?

[0,b] is point a

[0,c] is point c

9. 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 shown below gives the rate as measured every 3 hours for a 24-hour period.

(a) Use a midpoint Riemann sum with 4 subdivisions of equal length to approximate $\int R(t)dt$ on the interval from 0 to 24. Using correct units, explain the meaning of your answer in terms of water flow.

(b) Is there some time t, 0 < t < 24 such that R'(t) = 0? Justify your answer.

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

a) $6(10.4) + 6(11.2) + 6(11.3) + 6(10.2)$

≈ 258.6 gallons flowed out of the pipe from $t=0$ to $t=24$

b) Since $R(0) = R(24)$ and $R(t)$ is continuous on [0,24] and differentiable on (0,24) Rolle's Thm guarantees there exists a point, c, on (0,24) such that

$R'(c) = 0$