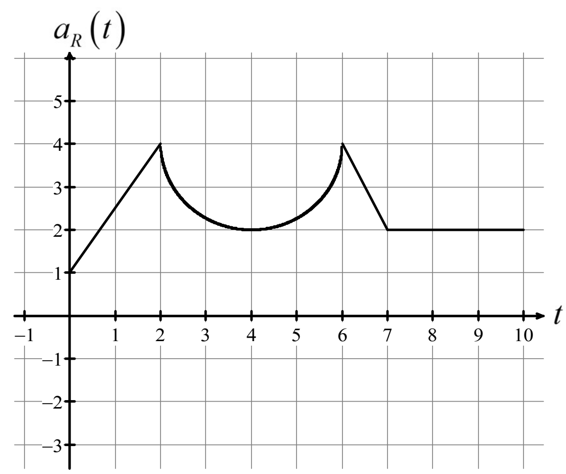
Name ______________________________ Date ______________ AP Calculus BC

Review Test #1 – 2020

t	0	3	5	6	7	10
$v_Q(t)$	10	7	4	3	2	1

1. The table above gives selected values of the function v_Q which represents the velocity of particle Q traveling along a horizontal line, for times on the interval $0 \le t \le 10$. Let $x_Q(t)$ and $a_Q(t)$ denote the position and acceleration of particle Q at time t, respectively. It is known that $x_Q(0) = 9$ and that $a_Q(t) < 0$ on $0 \le t \le 10$.

Particle R travels along the same horizontal line as particle Q, and its acceleration a_R is given by the graph shown at right on the interval $0 \le t \le 10$. The portion of the graph of $y = a_R(t)$ on the interval $2 \le t \le 6$ is a semicircle, and all other portions of the graph are piecewise-linear. Let $x_R(t)$ and $v_R(t)$ denote the position and acceleration of particle R at time t, respectively. It is known that $x_R(7) = 20$ and $v_R(7) = 4$.



(a) How much greater is the average acceleration of particle R than the average acceleration of particle Q on the interval $0 \le t \le 6$?

(b) Find the value of $v_R(0)$.

(c) Approximate the value of $x_Q(10)$ using a left Riemann sum with five subintervals indicated by the data in the table for v_Q. Is this approximation less than or greater than the true value of $x_Q(10)$? Explain your answer.

(d) Is it true that particle Q meets particle R at some time on the interval $7 \le t \le 10$? Explain your answer.

2. Some values of the function f whose derivatives of all orders exist are shown in the table below, along with some known values of f', f'', f''', and $f^{(4)}(x)$ as well. Let $g(x) = xf'(x)$.

x	0	1	2
$f(x)$	4	3	5
$f'(x)$	2	6	3
$f''(x)$	12	8	1
$f'''(x)$	6	0	4
$f^{(4)}(x)$	48	8	2

(a) Find the value of $\lim_{x\to 1} \dfrac{f(x) - 6x + 3}{3f'(2x) - 3\cos(2x-2) - 6x}$.

(b) Write the equation of the tangent line to $g(x)$ at $x = 2$ and use it to approximate a solution to the equation $g(x) = 26$.

(c) Write the third-degree Taylor polynomial centered at $x = 0$ for $g(x)$, and use it to approximate the value of $\int_0^2 g(x)dx$.

(d) It is known that $\int_3^0 2f(x)\,dx = 38$ and $\int_2^3 f(x)\,dx = 8$. Find the exact value of $\int_0^2 g(x)dx$.