AP Calculus BC 2 Assignment 224 Tuesday, March 24, 2015 Hour Name

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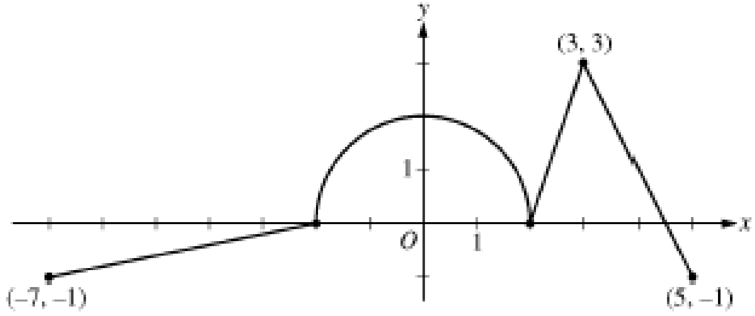


Graph of g'

The function g is defined and differentiable on the closed interval [-7, 5] and satisfies g(0) = 5. The graph of y = g'(x), the derivative of g, consists of a semicircle and three line segments, as shown in the figure above.

a.	Find g(3) and g(-2).
b.	Find the x-coordinate of each point of inflection of the graph of y = g(x) on the interval -7 < x < 5. Explain your reasoning.
c.	The function h is defined by $h(x) = g(x) - \frac{1}{2}x^2$. Find the x-coordinate of each critical point of h, where -7 < x < 5, and classify each critical point as the location of a relative minimum, relative maximum, or neither a minimum nor a maximum. Explain your reasoning.

The velocity vector of a particle moving in the xy-plane has components given by

$$\frac{dx}{dt} = 14\cos(t^2)\sin(e^t) \text{ and } \frac{dy}{dt} = 1 + 2\sin(t^2), \text{ for } 0 \le t \le 1.5.$$

At time t = 0, the position of the particle is (-2, 3).

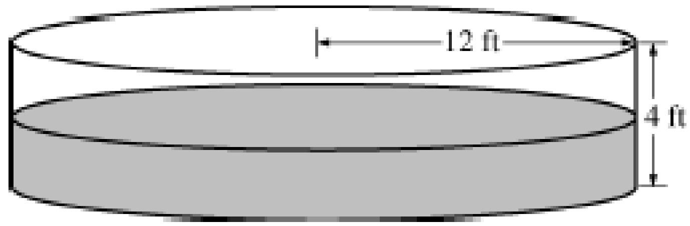
a. For $0 < t < 1.5$, find all values of t at which the line tangent to the path of the particle is vertical.

b. Write an equation for the line tangent to the path of the particle at t = 1.

c. Find the speed of the particle at t = 1.

d. Find the acceleration vector of the particle at t = 1.

t	0	2	4	6	8	10	12
P(t)	0	46	53	57	60	62	63



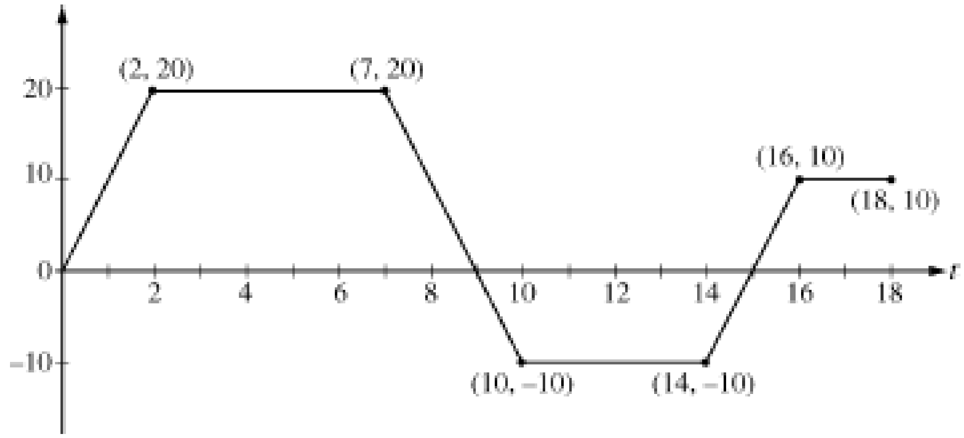
The figure above shows an above ground swimming pool in the shape of a cylinder with a radius of 12 feet and a height of 4 feet. The pool contains 1000 cubic feet of water at time $t = 0$. During the time interval $0 \le t \le 12$ hours, water is pumped into the pool at the rate $P(t)$ cubic feet per hour. The table above gives values of $P(t)$ for selected values of t. During the same time interval, water is leaking from the pool at the rate $R(t)$ cubic feet per hour, where $R(t) = 25e^{-0.05t}$. (Note: The volume V of a cylinder with radius r and height h is given by $V = \pi r^2 h$).

a. Use a midpoint Riemann sum with three subintervals of equal length to approximate the total amount of water that was pumped into the pool during the time interval $0 \le t \le 12$ hours. Show the computations that lead to your answer.

b. Calculate the total amount of water leaked out of the pool during the time interval $0 \le t \le 12$.

c. Use the results from parts (a) and (b) to approximate the volume of water in the pool at time $t = 12$ hours. Round your answer to the nearest cubic foot.

d. Find the rate at which the volume of water in the pool is increasing at time $t = 8$ hours. How fast is the water level in the pool rising at $t = 8$ hours? Indicate units of measure in both answers.



Graph of v

A squirrel starts at building A at time t = 0 and travels along a straight, horizontal wire connected to building B. For $0 \le t \le 18$, the squirrel's velocity is modeled by the piecewise-linear function defined by the graph above.

a.	At what times in the interval $0 < t \le 18$, if any, does the squirrel change direction? Give a reason for your answer.
b.	At what time in the interval $0 \le t \le 18$ is the squirrel farthest from building A? How far from building A is the squirrel at that time.
c.	Find the total distance the squirrel travels during the time interval $0 \le t \le 18$
d.	Write expressions for the squirrel's **acceleration a(t)**, **velocity v(t)**, and **distance x(t)** from building A that are valid for the time interval $7 < t < 10$.