4.3 Rates of Change Other Than Motion

CA #2

Calculus Name: ______________________________

1. The function $D(t) = 20 - 5.8\cos\left(\frac{\pi}{6}t\right)$ models the depth, in feet, of water t hours after 10 A.M. Find the instantaneous rate of change of the depth of the water at 1 P.M. Use appropriate units.

2.

t (minutes)	0	10	20	30
$W(t)$ (°F)	100	89	81	75

The temperature of water in a bathtub at time t is modeled by a strictly decreasing, twice-differentiable function W, where $W(t)$ is measured in degrees Fahrenheit and t is measured in minutes. The water is cooling for 30 minutes, beginning at time $t = 0$. Values of $W(t)$ at selected times t are given in the table above. Use the data in the table to estimate $W'(20)$. Show the computations that lead to your answer. Using correct units, interpret the meaning of your answer in the context of this problem.

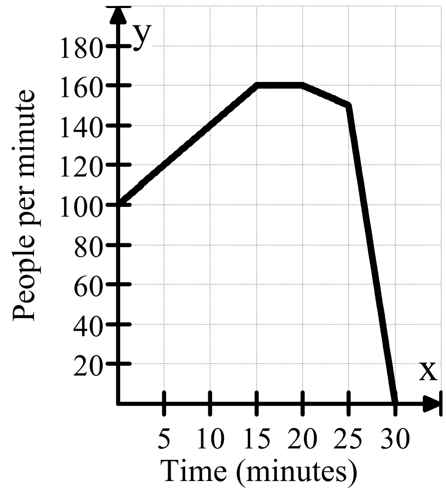
---

3. For time $t \geq 0$, let $r(t) = 70\left(1 - e^{-.04t^2}\right)$ represent the speed, in miles per hour, at which a car travels along a straight road. Find $r'(2)$. Indicate units of measure.

---

4. The wind chill is the temperature, in degrees Fahrenheit (°F), a human feels based on the air temperature, in degrees Fahrenheit, and the wind velocity, v, in miles per hour. If the air temperature is 32 °F, then the wind chill is given by $w(v) = 55.628 - 22.07v^{0.16}$. Find $w'(30)$. Using correct units explain the meaning of $w'(30)$ in terms of wind chill.

5.



A certain high school's lunch line has 100 people in line when the cafeteria opens. The cafeteria is able to serve 100 people per minute. The graph above shows the rate, $r(t)$, at which students get in line during the 30-minute lunch time. Time t is measured in minutes from the time lunch begins. Is the number of people waiting in line to get lunch increasing or decreasing between $t = 5$ and $t = 10$? Justify your answer.

Answers to 4.3 CA #2

1. $D'(3) = 3.0368$ feet per hr	2. Three possible answers: $\frac{W(30)-W(10)}{30-10} = -0.7$ °F per minute; $\frac{W(20)-W(10)}{20-10} = -0.8$ °F per minute; $\frac{W(30)-W(20)}{30-20} = -0.6$ °F per minute	
3. $r'(2) \approx 9.544$ miles per hr^2	4. If the wind is traveling at 30 mph, then the wind chill is getting colder at a rate of -0.2028 °F per mile per hour.	5. Increasing because at $t = 5$ the rate of students getting in line is 120 people / min and only 100 per min are being served. Between $t = 5$ and $t = 10$, the rate increases even more.