

3. The wind chill is the temperature, in degrees Fahrenheit ( $^{\circ}\text{F}$ ), a human feels based on the air temperature, in degrees Fahrenheit, and the wind velocity  $v$ , in miles per hour (mph). If the air temperature is  $32^{\circ}\text{F}$ , then the wind chill is given by  $W(v) = 55.6 - 22.1v^{0.16}$  and is valid for  $5 \leq v \leq 60$ .
- (a) Find  $W'(20)$ . Using correct units, explain the meaning of  $W'(20)$  in terms of the wind chill.
- (b) Find the average rate of change of  $W$  over the interval  $5 \leq v \leq 60$ . Find the value of  $v$  at which the instantaneous rate of change of  $W$  is equal to the average rate of change of  $W$  over the interval  $5 \leq v \leq 60$ .
- (c) Over the time interval  $0 \leq t \leq 4$  hours, the air temperature is a constant  $32^{\circ}\text{F}$ . At time  $t = 0$ , the wind velocity is  $v = 20$  mph. If the wind velocity increases at a constant rate of 5 mph per hour, what is the rate of change of the wind chill with respect to time at  $t = 3$  hours? Indicate units of measure.
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