Chain Rule

You are driving north from Durham. The temperature gets colder and colder farther and farther north of Durham. The function \( F(x) \) gives the temperature, in degrees Fahrenheit, \( x \) miles north of Durham. The function \( s(t) \) gives your distance north of Durham, in miles, after you have been driving for \( t \) hours.

1. Explain the meaning of the function \( f(t) = F(s(t)) \):

2. What are the units of \( f'(t) \)?

3. Explain the meaning of each of the following (give units):
   
   - (a) \( s(3) = 160 \)
   - (b) \( s'(3) = 80 \)
   - (c) \( F(160) = 75 \)
   - (d) \( F'(160) = -0.05 \)

4. After 3 hours of driving, how fast is the temperature changing outside your car? Give units. Use your answers from above.

5. \( f'(3) = \) ____________ (remember to use units)

6. Which of the following is the correct formula for \( f'(3) \)? Circle your answer:
   
   - \( f'(3) = F'(3) \cdot s'(3) \)
   - \( f'(3) = F'(s'(3)) \)
   - \( f'(3) = F'(s(3)) \cdot s'(3) \)
Selected Answers:

(2) Degrees Fahrenheit per hour.

(3a) After three hours you have traveled 160 miles.

(3b) Three hours after you leave you are traveling at a speed of 80 miles per hour.

(3c) The temperature 160 miles north of Durham is 75 degrees Fahrenheit.

(3d) 160 miles north of Durham the temperature decreases at a rate of 0.05 degrees Fahrenheit per mile.

(5) \( f'(3) = -4 \) degrees Fahrenheit per hour.