

Show all work, including mental steps, in a clearly organized way that speaks for itself. Use proper mathematical notation, identifying expressions by their proper symbols (introducing them if necessary), and use EQUAL SIGNS and arrows when appropriate. Always SIMPLIFY expressions. BOX final short answers. LABEL parts of problem. Keep answers EXACT (but give decimal approximations for interpretation if appropriate). Indicate where technology is used and what type (Maple, GC).

1. The wind-chill index W is the perceived temperature when the actual temperature is T (both in degrees Centigrade) and the wind speed is v (in km/s), so we can write $W=f(T, v)$. Values are recorded in the table.

(a) What is the value of $f(-15, 30)$? What is its meaning in words (a complete sentence)?

(b) For what value of v is $f(-10, v) = -23$? Formulate this question in words.

(c) What is the meaning of the function $W=f(-15, v)$?

		Wind speed (km/h)					
		v	20	30	40	50	60
Actual temperature (°C)	T						
	-10	-18	-20	-21	-22	-23	-23
	-15	-24	-26	-27	-29	-30	-30
	-20	-30	-33	-34	-35	-36	-37
-25	-37	-39	-41	-42	-43	-44	

(d) Evaluate the average rate of change for $f(-15, v)$ for the intervals $v = 20 \dots 30$ and then $v = 30 \dots 40$ and then average these to get a decimal value for the "instantaneous" rate of change of $f(-15, v)$ at $v = 30$: $\frac{d}{d v} f(-15, v) \Big|_{v=30}$.

e) Using this result, to what value would you expect the perceived temperature to increase to if the wind speed decreases from 30 km/h to 28 km/h an actual temperature of -15 degrees?

► **solution**