Math 211 Second Partial Derivatives Practice

1. The wind chill $w(v,T)$, in degrees Fahrenheit, is a function of the wind speed v, in miles per hour, and the air temperature T, in degrees Fahrenheit.

$v \backslash T$	-30	-25	-20	-15	-10	-5	0	5	10	15	20
5	-46	-40	-34	-28	-22	-16	-11	-5	1	7	13
10	-53	-47	-41	-35	-28	-22	-16	-10	-4	3	9
15	-58	-51	-45	-39	-32	-26	-19	-13	-7	0	6
20	-61	-55	-48	-42	-35	-29	-22	-15	-9	-2	4
25	-64	-58	-51	-44	-37	-31	-24	-17	-11	-4	3
30	-67	-60	-53	-46	-39	-33	-26	-19	-12	-5	1
35	-69	-62	-55	-48	-41	-34	-27	-21	-14	-7	0
40	-71	-64	-57	-50	-43	-36	-29	-22	-15	-8	-1

a. Estimate the partial derivatives $w_T(20,-15)$, $w_T(20,-10)$, and $w_T(20,-5)$. Use these results to estimate the second-order partial $w_{TT}(20, -10)$. What does this value tell us?

b. In a similar way, estimate the second-order partial $w_{vv}(20,-10)$. What does this value tell us?

c. Estimate the partial derivatives $w_T(20,-10)$, $w_T(25,-10)$, and $w_T(15,-10)$, and use your results to estimate the partial $w_{Tv}(20,-10)$. What does this value tell us?

d. Estimate the partial derivative $w_{vT}(20, -10)$. What does this value tell us?

Adapted from *Active Calculus* by S. Schlicker, D. Austin, and M. Boelkins