

Lecture # 21 (Function of several variables)

Thursday, November 13, 2025 11:11 AM

Table 9.2 Quantity of beef bought (lbs/household/week)

		P			
		3.00	3.50	4.00	4.50
I	20	2.65	2.59	2.51	2.43
	40	4.14	4.05	3.94	3.88
	60	5.11	5.00	4.97	4.84
	80	5.35	5.29	5.19	5.07
	100	5.79	5.77	5.60	5.53

3. Give tables for beef consumption as a function of p , with I fixed at $I = 20$ and $I = 100$. Give tables for beef consumption as a function of I , with p fixed at $p = 3.00$ and $p = 4.00$. Comment on what you see in the tables.
4. How does beef consumption vary as a function of household income if the price of beef is held constant?
5. Make a table showing the amount of money, M , that the average household spends on beef (in dollars per household per week) as a function of the price of beef and household income.

$$C = f(p, I) \quad C:$$

$I \text{ fix } P \uparrow C \downarrow$

$P \text{ fix } I \uparrow C \uparrow$

Price is fixed

$$\frac{PI}{C}$$

$$M \Rightarrow f(p, I)$$

$$M = C \times P$$

$$I=20, \quad 3 \times 2.65 = 7.95$$

11. The heat index is a temperature which tells you how hot it feels as a result of the combination of temperature and humidity. See Table 9.3. Heat exhaustion is likely to occur when the heat index reaches 105°F.

- If the temperature is 80°F and the humidity is 50%, how hot does it feel?
- At what humidity does 90°F feel like 90°F?
- Make a table showing the approximate temperature at which heat exhaustion becomes a danger, as a function of humidity.
- Explain why the heat index is sometimes above the actual temperature and sometimes below it.

Table 9.3 Heat index (°F) as a function of humidity (H%) and temperature (T°F)

		T									
		70	75	80	85	90	95	100	105	110	115
H	0	64	69	73	78	83	87	91	95	99	103
	10	65	70	75	80	85	90	95	100	105	111
	20	66	72	77	82	87	93	99	105	112	120
	30	67	73	78	84	90	96	104	113	123	135
	40	68	74	79	86	93	101	110	123	137	151
	50	69	75	81	88	96	107	120	135	150	
	60	70	76	82	90	100	114	132	149		

12. Using Table 9.3, graph heat index as a function of humidity with temperature fixed at 70°F and at 100°F. Explain the features of each graph and the difference between them in common-sense terms.

1'

$$D = f(H, T)$$

105 110 115

$$T = f(H)$$

95 100 105 110 115

10	-	-	-	105	111
20				105	112 120
30				113	123 135
40			110	123	137 151
50	107		120	135	150
60	114		132	149	