

AEB 6933
Statistics for Food and Resource Economics
Examination I

1. Given that $f(x)$ is distributed uniform $x=[0,9]$, derive the distribution y such that

$$y = \phi(x) = \sqrt{x}.$$

What is the expected value of

$$h(y) = \begin{cases} 2 - y & \text{such that } y \leq 2 \\ 0 & \text{otherwise} \end{cases}?$$

2. Derive the moment generating function for the normal. Using the first two columns of table 1, compute the mean and variance of the normal distribution. Do the third and fourth moments conform to your expectations?

Table 1. Random Distribution

Observation	x	x ²	x ³	x ⁴
1	0.81327	0.66140	0.53790	0.43745
2	0.30711	0.09431	0.02896	0.00890
3	0.30947	0.09577	0.02964	0.00917
4	0.50806	0.25812	0.13114	0.06663
5	0.86261	0.74410	0.64187	0.55368
6	0.91362	0.83470	0.76260	0.69673
7	0.88713	0.78701	0.69818	0.61938
8	0.76219	0.58093	0.44278	0.33748
9	0.67116	0.45046	0.30233	0.20291
10	0.69247	0.47952	0.33206	0.22994
11	0.00259	0.00001	0.00000	0.00000
12	0.63728	0.40613	0.25882	0.16494
13	0.93605	0.87618	0.82015	0.76770
14	0.12572	0.01581	0.00199	0.00025
15	0.91023	0.82852	0.75414	0.68644
16	0.57275	0.32804	0.18788	0.10761
17	0.14420	0.02079	0.00300	0.00043
18	0.35242	0.12420	0.04377	0.01543
19	0.34554	0.11939	0.04126	0.01426
20	0.71490	0.51108	0.36537	0.26120
21	0.23511	0.05528	0.01300	0.00306
22	0.22770	0.05185	0.01180	0.00269
23	0.41264	0.17027	0.07026	0.02899
24	0.78597	0.61775	0.48554	0.38162
25	0.24312	0.05911	0.01437	0.00349
Sum	13.37330	9.17074	6.97880	5.60038

3. Given the joint distribution function

$$f(x, y) = \frac{12}{7}(x^2 + xy)$$

over the range $x, y \in [0, 1]$: Are the random variables x and y independent?

4. Given the covariance matrix

$$\Sigma = \begin{pmatrix} \sigma_{11} & \sigma_{12} \\ \sigma_{21} & \sigma_{22} \end{pmatrix} = \begin{pmatrix} 5 & -1 \\ -1 & 3 \end{pmatrix}$$

Find the conditional variance of σ_{11} given the value of x_2 .

5. Given that the probability of a heads in a coin toss is .4 and letting heads=1, what is the expected value and the variance of 25 coin tosses?