Show **all** of your work on this assignment and answer each question fully in the given context.

Please staple your assignment!

1. **Ch. 5, Exercise 7, pg. 323:** In a grinding operation, there is an upper specification of 3.150 in. on a dimensions of a certain part after grinding. Suppose that the standard deviation of this normally distributed dimension for parts of this type ground to any particular mean dimension μ is $\sigma = 0.002$ in. Suppose further that you desire to have no more than 3% of the parts fail to meet specifications. What is the maximum (minimum machining cost) μ that can be used if this 3% requirement is to be met?[10 pts]
   Hint: the question is giving you information on $P(X > 3.15) \leq 0.03$.

2. **Ch 5, Exercise 42, pg. 332:** Suppose that engineering specifications on the shelf depth of a certain slug to be turned on a CNC lathe are from 0.0275 in. to 0.0278 in. and that values of this dimension produced on the lathe can be described using a normal distribution with mean μ and standard deviation σ.

   (a) If $\mu = 0.0276$ and $\sigma = 0.0001$, about what fraction of shelf depths are in specifications?[10 pts]

   (b) What machine precision (as measured by σ) would be required in order to produce about 98% of shelf depths within engineering specifications (assuming that μ is at the midpoint of the specifications)?[10 pts]
   Hint: you are looking for the value of σ in this question.

3. **Ch 5.4, Exercise 2, pg. 300:** Quality audit records are kept on numbers of major and minor failures of circuit packs during burn-in of large electronic switching devices. They indicate that for a device of this type, the random variables

   $$X = \text{ the number of major failures}$$

   and

   $$Y = \text{ the number of minor failures}$$

   can be described at least approximately by the accompanying joint distribution.

Y | X	**0**	**1**	**2**
0	0.15	0.05	0.01
1	0.1	0.08	0.01
2	0.1	0.14	0.02
3	0.1	0.08	0.03
4	0.05	0.05	0.03

   (a) Find the marginal probability functions for both X and Y ($f_x(x)$ and $f_y(y)$, respectively).[10 pts]

   (b) Are X and Y independent? Explain.[5pts]

   (c) Find the mean and variance of X (EX and Var$X$)[10 pts]

   (d) Find the mean and variance of Y (EY and Var$Y$)[10 pts]

(e) Find the conditional probability function for Y, given that $X = 0$ – i.e., that there are no major circuit pack failures ($f_{Y|X}(y|0)$). What is the mean of this conditional distribution?[10 pts]

4. **Ch. 5.2, Exercise 3, pg. 263:** Suppose that X is a normal random variable with mean 43 and standard deviation 3.6. Evaluate the following probabilities involving X:

   (a) $P[X < 45.2]$ [5 pts]

   (b) $P[|X - 43| \leq 2]$ [5 pts]

   (c) $P[|X - 43| > 1.7]$ [5 pts]

   Now find numbers # such that the following statements involving X are true:

   (d) $P[X < \#] = .95$ [5 pts]

   (e) $P[|X - 43| > \#] = .05$ [5 pts]

   Total: 90 pts