Math 302 Probs. & Stats II Worksheet 0 2015

Use pencil only. **All the necessary & sufficient steps for a proof should be shown - further, justification for each step should be provided. If there is no work shown - no credit will be earned - justification must be given to claim mathematical truth!**

If an answer does not exist write D.N.E. (Does Not Exist) and explain why it does not exist.

An asterisk indicates a question is "board worthy;" the lack thereof indicates the problem is simply routine.

0. Download and print out a copy of Math 301 Handout 1, 2, 2 ½, 3, 4, and 5.
Math 301 Handout 5 is logically equivalent to Math 302 Handout 1.

*1. The proportion of defective units produced by a manufacturing company is a random variable that is adequately approximated by beta random variable with $\alpha = 1$ and $\beta = 5$. What is the probability that the proportion of defective units is greater than 10%?

2. Suppose $X \sim \text{Ray}(x, 5)$. Find $\Pr(\mu < X \leq 2)$ where μ is of course $E[X]$.

3. Suppose the probability is $\frac{3}{4}$ that an applicant for a driver's license will pass the road test on any given attempt.

A. The p. m. f. in this case is a : ______________________________________

because____________________

B. What is the probability that the applicant will pass the road test (finally) on his fourth try?

*4. Prove or disprove:
Let S be a well defined sample space with E_1 , E_2 , $\wedge$ E_3 non-trivial events.
If $\Pr(E_1 \mid E_3) > \Pr(E_2 \mid E_3)$ and $\Pr(E_1 \mid E_3^C) > \Pr(E_2 \mid E_3^C)$, then $\Pr(E_1) \geq \Pr(E_2)$.

*5. . Suppose $X \sim \text{Nor}(x, \mu, \sigma)$. Prove or disprove that $E[X] = \mu$
(hint: $M_X(t) = e^{(\mu t + \frac{1}{2}\sigma^2 t^2)}$)

6. Suppose $X \sim \text{Nor}(x, \mu, \sigma) \sim \text{Nor}(x, 100, 16)$.
Find $\Pr(100 \leq X)$.

7. Suppose $X \sim \text{Nor}(x, \mu, \sigma) \sim \text{Nor}(x, 100, 16)$.
Find $\Pr(116 \leq X)$.

8. Suppose $X \sim \text{Nor}(x, \mu, \sigma) \sim \text{Nor}(x, 100, 16)$.
Approximate $\Pr(100 \leq X < 140)$ to 4 decimal place accuracy.

9. Suppose $X \sim \text{Nor}(x, \mu, \sigma) \sim \text{Nor}(x, 100, 16)$.
Approximate $\Pr(X > 108)$ to 4 decimal place accuracy.

*10. Suppose $X \sim Wei(x, \alpha, \beta) \ni \alpha > 0 \wedge \beta > 0$
Prove or disprove that $\mu = \alpha\, \Gamma(1 + \beta^{-1})$

11. Suppose $X \sim f(x)$ where $f(x)$ is a well defined probability mass or density function and

$M_X(t) = (1 - \frac{1}{2} t)^{-5} (1 - \beta t)^{-\alpha} \quad \ni t < 2$

A. Find μ B. Find σ

12. Suppose $R \sim Ray(r, 1)$
Find $Pr(r < 1))$

13. Suppose $D \sim Par(d, \alpha) \sim Par(d, 3)$
Find $Pr(d < \mu)$

14. Suppose $K \sim Exp(k, 2)$
A. Find $Pr(k < \ln(4))$ B. Find $Pr(k > 15 \mid k > 5)$

15. Suppose $K \sim Exp(k, 2)$
A. Find $Pr(k > \ln(4))$ B. Find $Pr(k \geq \ln(4))$ C. <u>Find $Pr(k < 5 \mid k < 15)$</u>

16. Suppose $A \sim Uni(a, -2, 5)$.
Find $Pr(A \in (-1, 3))$

17. Suppose $A \sim Uni(a, -2, 5)$.
Find $Pr(A \in [-1, 3))$

*18.
A. Suppose $A \sim Uni(a, -2, 5)$. Find $Pr(A \in \{2, 4\})$
B. Suppose $A \sim DisUni(a, -2, 5)$. Find $Pr(A \in \{2, 4\})$

19. Let $f((x, y, z)) = xy^3 - zx^5 + x^2yz$

A. Find $\frac{\partial^2 f}{\partial x \partial y}$ B. Find $\frac{\partial^2 f}{\partial x \partial x}$ C. Find $\frac{\partial^2 f}{\partial z \partial x}$ D. Find $\frac{\partial^3 f}{\partial z \partial x \partial y}$

20. Find $\int_1^2 \int_1^{x^2} \left(\frac{x}{y}\right) dydx$

21. Find $\int_1^2 \int_2^3 dydx$ and find $\int_2^3 \int_1^2 dxdy$

22. Find $\int_0^1 \int_{x^2}^{x} \int_{x-y}^{x+y} (x + 2y + 4z) dzdydx$

22. Let $\Omega = \{(x, y\}: x \in [0, 1]. \wedge x^2 < y \leq \sqrt{x} \}$

Find the volume of the solid under the surface $z = x^2 + y^2$ and lying above Ω.