확률및통계 **2021-2학기 수학과 졸업시험**

1. (a) (6) Verify the following inequality holds for any events A and B:

$$\max\{P(A)+P(B)-1,0\} \le P(A\cap B) \le \min\{P(A),P(B)\}.$$

(b) (4) Identify when each equality holds.

2. Let A be the area of a circle with radius R where R follows an exponential distribution with density $f(r)=e^{-r}$ for $r>0$.

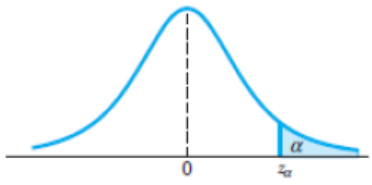
(a) (6) Find the expected value μ of A.

(b) (4) What is the probability that A exceeds μ?

3. (10) A random sample of size 16 was taken from a normal distribution with mean μ and variance σ^2, and it showed the sample mean $\bar{x}=1.8$ and sample standard deviation $s=3$. Test the hypothesis $H_0:\mu=0$ against $H_1:\mu\neq 0$ at 5% significance level. (May use the tables blow.)

Critical values Z_α of the standard normal distribution

α		
0.10	0.05	0.025
1.282	1.645	1.960



Critical values t_α of the t-distribution with ν degrees of freedom

	α		
ν	0.10	0.05	0.025
14	1.345	1.761	2.145
15	1.341	1.753	2.131
16	1.337	1.746	2.120
17	1.333	1.740	2.110