本試題是否可以使用計算機： ☑可使用 ， □不可使用 （請命題老師勾選）

微積分

1. (12%) Let all matrices occurring in the following equations be square of order n. Solve for X and Y, stating which matrices are assumed to be nonsingular.

   $XA+YB=C, XD+YE=F$

2. (12%) The function **f** is defined by the equations.

   $$\begin{cases} y_1 = x_1^2 + x_2^2 - x_3^2 \\ y_2 = x_1^2 - x_2^2 + x_3^2 \\ y_3 = -x_1^2 + x_2^2 + x_3^2 \end{cases}$$

   At the point $(x_1, x_2, x_3)=(2, 1, 1)$ we find $(y_1, y_2, y_3)=(4, 4, -2)$. If $\mathbf{x} = (2.01, 1.03, 1.02)$, make reasonable estimate of **y**.

3. (12%) Evaluate the following integrals.

   $$\int_0^\infty \frac{1}{1+x^2}\,dx$$

4. (12%) Let $f(x)$ be continuous for $a \leq x \leq b$. Prove that

   $$\frac{d}{dx}\int_a^{x^2} f(t)dt = 2xf(x^2), \ a \leq x^2 \leq b$$

機率與統計

5. (12%) The prior probabilities for events A_1, A_2, and A_3 are $P(A_1)=.20$, $P(A_2)=.50$, and $P(A_3)=.30$. The conditional probabilities of event B given A_1, A_2, and A_3 are $P(B|A_1)=.50$, $P(B|A_2)=.40$, and $P(B|A_3)=.30$. Applying Bayes' theorem to compute $P(A_1|B)$, $P(A_2|B)$, and $P(A_3|B)$.

6. (8%) A volunteer ambulance service handles 0 to 5 service calls on any given day. The probability distribution for the number of service calls is as follows.

Number of Service Calls	Probability
0	.10
1	.15
2	.30
3	.20
4	.15
5	.10

   (i)　What is the expected number of service calls?

   (ii)　What is the variance in the number of service calls? What is the standard deviation?

7. (12%) A binomial probability distribution has $p = .20$ and $n = 100$.

   (i)　What is the mean and standard deviation?

   (ii)　Is this a situation in which binomial probabilities can be approximated by the normal probability distribution? Explain.

   (iii)　What is the probability of 18 to 22 successes?

8. (10%) A survey by the Society for Human Resource Management asked 346 job seekers why employees change jobs so frequently. The answer selected most (152 times) was "higher compensation elsewhere."
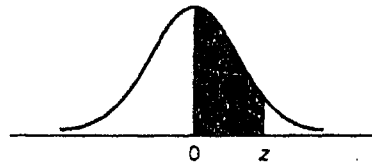
（背面仍有題目,請繼續作答）

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(i) What is the point estimate of the proportion of job seekers who would select "higher compensation elsewhere" as the reason for changing jobs?

(ii) What is the 95% confidence interval estimate of the population proportion?

9. (10%) Young Adult magazine states the following hypotheses about the mean age of its subscribers.

$H_0 : \mu = 28$

$H_a : \mu \neq 28$

(i) What would it mean to make a Type II error in this situation?

(ii) The population standard deviation is assumed known at $\sigma = 6$ years and the sample size is 100. With $\alpha = .05$, what is the probability of accepting H_0 for μ equal to 26?

附錄

TABLE 4　Normal Curve Areas

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990