1 (8%) Test for linear independence:
a) $\mathbf{u} = 15\mathbf{i} - 21\mathbf{k}$, $\mathbf{v} = 20\mathbf{i} - 28\mathbf{k}$
b) $\mathbf{u} = 2\mathbf{i} + \mathbf{j}$, $\mathbf{v} = 2\mathbf{j} + \mathbf{k}$, $\mathbf{w} = 2\mathbf{i} + \mathbf{k}$, $\mathbf{p} = \hat{\mathbf{i}} + \mathbf{j} + \mathbf{k}$

2 (8%) Find the parametric equations for the line satisfying the given conditions: passes through (1, 1, 2) and is parallel to the line $x = 2 - 5t$, $y = 1 + 2t$, $z = 3t$.

3 (8%) Solve the simultaneous linear equations:
a) $3x - 2y = 4$, $x + 2y = 4$
b) $x - y + z = 0$, $3x - y + 2z = 0$, $6x - 4y + 5z = 0$

4 (4%) If A and B are $n \times n$ matrices, is $A^2 - B^2$ necessary equal to $(A - B)(A + B)$? When must this be true?

5 (8%) Verify that the following matrix is nonsingular and find its inverse matrix.

$$A = \begin{bmatrix} 2 & 0 & 1 \\ 3 & 1 & 0 \\ 4 & 0 & 3 \end{bmatrix}$$

6 (6%) If there are 30 skaters competing at the Olympic Games, in how many different ways can the gold, silver, and bronze medals be given?

7 (6%) The probability that Joe Student will get an A on the history exam is 0.25, and the probability that he will get a B is 0.35. Find the probability that Joe gets a B or better on the history exam.

8 (6%) Two cards are drawn from a well-shuffled standard 52-card deck of playing cards. Find the probability that one card is a king and the other card is a queen.

9 (10%) Find the standard deviation of the following probability distribution.

Five-question true/false quiz

x	$P(x)$
0	0.03125
1	0.15625
2	0.3125
3	0.3125
4	0.15625
5	0.03125

10 (8%) The heights of adult females are normally distributed with a mean of 63.6 inches and a standard deviation of 2.5 inches. Find the probability that a randomly selected female is 60 inches or shorter.

(背面仍有題目,請繼續作答)

11 (8%) The number of fares for a Las Vegas taxi driver on Fridays is approximately normally distributed with a mean of 21.5 fares and a standard deviation of 6.3 fares. Find the probability that a driver has between 24 and 26 fares on a randomly selected Friday.

12 (8%) IQ scores are normally distributed with a mean of 100 points and a standard deviation of 15 points. If 100 people are randomly selected, find the probability that their mean score is below 97.

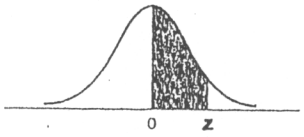
13 (12%) An algebra instructor has designed a final exam that he believes will produce a mean score of 70. Mr. Thomas, one of his colleagues, disagree, claiming that the mean score for all algebra students on this exam will be below 70. Mr. Thomas randomly selected 38 algebra students, and fives them the exam. Here are their scores.

32 41 43 44 46 46 47 48 49 50
52 54 54 56 57 58 58 60 60 61
65 66 66 67 67 68 68 68 68 71
72 76 83 87 92 92 94 100

Use these sample data to test Mr. Thomas's claim at the 0.01 level of significance.

參考附表

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

Source: Abridged from Table I of A. Hald. *Statistical Tables and Formulas* (New York: John Wiley & Sons, Inc.), 1952. Reproduced by permission of A. Hald and the publisher.