

任選五題，每題 20 分。超過五題將依答題順序前五題給分。

1. Show that the magnitude of a vector \vec{A} , $A = \sqrt{A_x^2 + A_y^2}$, is independent of the rotation of the coordinate system.

2. Vector \vec{D} is a linear combination of three non-coplanar (and non-orthogonal)

$$\text{vectors : } \vec{D} = a \vec{A} + b \vec{B} + c \vec{C}$$

Show that the coefficients are given by a ratio of triple scalar products

$$a = \frac{\vec{D} \cdot \vec{B} \times \vec{C}}{\vec{A} \cdot \vec{B} \times \vec{C}}$$

3. Verify that

$$\nabla \times (\nabla \times \vec{V}) = \nabla \nabla \cdot \vec{V} - \nabla \cdot \nabla \vec{V}$$

by direct expansion in Cartesian coordinate.

4. 說明 Newton-Rapson method 求解非線性方程式 $f(x)=0$ 的原理。

5. 說明 "least-square regression" 的原理。

6. 說明 Gauss-Jordan Elimination 求解線性聯立方程式的過程。

7. 假設 A 廠牌之震波探測器其平均壽命為 10 年，標準差為 2 年；B 廠牌之探測器其平均壽命則為 8 年，標準差為 1 年。今若從 A 廠牌隨機抽出 100 台，而從 B 廠牌抽出 50 台，試問 A 廠牌樣本的平均壽命大於 B 廠牌樣本平均壽命至少一年的機率？

8. 有一工程欲使用某種建築材料，經使用兩種測試方法，抽取不同樣本數以檢測其強度，其結果如下 (\bar{x} 代表樣本平均，S 代表樣本標準差)：

A 法抽取 15 個樣本： $\bar{x}_A = 0.5$, $S_A = 0.02$;

B 法抽取 10 個樣本： $\bar{x}_B = 0.6$, $S_B = 0.05$;

試以 $\alpha = 0.1$ 檢定兩種方法檢測結果是否有顯著差異？(假設母體為常態分配)

國立交通大學 97 學年度碩士班考試入學試題

科目：數學(3132)

考試日期：97 年 3 月 8 日 第 1 節

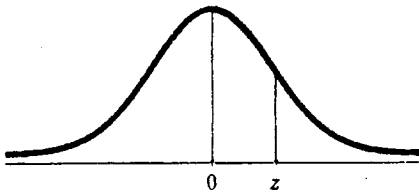
系所班別：土木工程學系 組別：土木系己組

第 2 頁，共 3 頁

【可使用計算機】*作答前請先核對試題、答案卷(試卷)與准考證之所組別與考科是否相符！！

9. 某一建築工地面臨一人行道，人行道上方正在施作建築外牆水泥粉刷，水泥渣不時會掉落在人行道上方之安全遮篷。假設遮篷可視為一線段，兩端點分別為 A 與 B，水泥渣掉落於 A、B 之間任一點的機率相同。試問：
- (1) 水泥渣掉落在較靠近 A 點的機率為何？
 - (2) 水泥渣掉落在與 A 點距離超過與 B 點二倍距離的機率為何？

標準常態機率表



標準常態 (z) 分配

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

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第 3 頁，共 3 頁

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TABLE E. 3
Critical Value of t (Continued)

Degrees of Freedom	UPPER-TAIL AREAS											
	0.25	0.10	0.05	0.025	0.01	0.005	0.25	0.10	0.05	0.025	0.01	0.005
1	1.0000	3.0777	6.3138	12.7062	31.8207	63.6574	0.6794	1.2991	1.6766	2.0096	2.4049	2.6880
2	0.8163	1.8856	2.9200	4.3027	6.9646	9.9248	1.2957	1.9848	1.6759	2.0086	2.4033	2.6778
3	0.7649	1.6354	2.3534	3.1824	4.5407	5.8409	0.6793	1.2984	1.6753	2.0076	2.4017	2.6757
4	0.7407	1.5112	2.1318	2.7764	3.7469	4.6041	0.6792	1.2980	1.6747	2.0066	2.4002	2.6737
5	0.7267	1.4739	2.0150	2.5706	3.4649	4.0322	0.6791	1.2977	1.6741	2.0057	2.3988	2.6718
6	0.7176	1.4398	1.9132	2.4469	3.1427	3.7034	0.6790	1.2974	1.6736	2.0049	2.3974	2.6700
7	0.7111	1.4119	1.8916	2.3646	2.9985	3.4995	0.6789	1.2969	1.6730	2.0040	2.3961	2.6682
8	0.7061	1.3968	1.8795	2.3060	2.9085	3.3554	0.6788	1.2966	1.6725	2.0032	2.3948	2.6665
9	0.7027	1.3840	1.8711	2.2622	2.8214	3.2908	0.6787	1.2963	1.6720	2.0025	2.3936	2.6649
10	0.6998	1.3722	1.8635	2.2281	2.7638	3.1693	0.6786	1.2961	1.6716	2.0017	2.3924	2.6633
11	0.6974	1.3634	1.8574	2.2010	2.7181	3.1078	0.6785	1.2956	1.6712	2.0010	2.3912	2.6618
12	0.6955	1.3562	1.8523	2.1788	2.6800	3.0545	0.6784	1.2954	1.6707	2.0003	2.3901	2.6603
13	0.6938	1.3502	1.8479	2.1604	2.6503	3.0125	0.6783	1.2952	1.6702	1.9996	2.3890	2.6589
14	0.6924	1.3450	1.8439	2.1448	2.6215	2.9768	0.6782	1.2951	1.6697	1.9991	2.3880	2.6575
15	0.6912	1.3406	1.8406	2.1315	2.6025	2.9467	0.6781	1.2949	1.6692	1.9983	2.3870	2.6561
16	0.6901	1.3369	1.8378	2.1199	2.5835	2.9208	0.6780	1.2947	1.6686	1.9971	2.3851	2.6536
17	0.6892	1.3334	1.8354	2.1098	2.5689	2.8982	0.6779	1.2945	1.6681	1.9966	2.3842	2.6524
18	0.6884	1.3304	1.8331	2.1009	2.5524	2.8784	0.6778	1.2943	1.6676	1.9960	2.3833	2.6512
19	0.6878	1.3277	1.8311	2.0930	2.5395	2.8609	0.6777	1.2941	1.6671	1.9955	2.3824	2.6501
20	0.6870	1.3253	1.8293	2.0860	2.5280	2.8453	0.6776	1.2939	1.6667	1.9949	2.3816	2.6490
21	0.6864	1.3233	1.8277	2.0796	2.5177	2.8314	0.6775	1.2938	1.6663	1.9944	2.3808	2.6479
22	0.6858	1.3215	1.8262	2.0739	2.5083	2.8188	0.6774	1.2936	1.6659	1.9939	2.3800	2.6469
23	0.6853	1.3199	1.8249	2.0687	2.4999	2.8073	0.6773	1.2934	1.6655	1.9934	2.3793	2.6458
24	0.6848	1.3178	1.8239	2.0639	2.4922	2.7969	0.6772	1.2933	1.6651	1.9930	2.3785	2.6449
25	0.6844	1.3163	1.8231	2.0595	2.4851	2.7874	0.6771	1.2931	1.6647	1.9925	2.3778	2.6439
26	0.6840	1.3150	1.8224	2.0558	2.4786	2.7787	0.6770	1.2929	1.6643	1.9921	2.3771	2.6430
27	0.6837	1.3137	1.8218	2.0518	2.4727	2.7707	0.6769	1.2928	1.6640	1.9917	2.3764	2.6421
28	0.6834	1.3125	1.8211	2.0484	2.4671	2.7633	0.6768	1.2926	1.6636	1.9913	2.3756	2.6412
29	0.6830	1.3114	1.8204	2.0452	2.4620	2.7564	0.6767	1.2925	1.6632	1.9908	2.3751	2.6403
30	0.6828	1.3104	1.8197	2.0423	2.4573	2.7500	0.6766	1.2924	1.6628	1.9905	2.3745	2.6395
31	0.6825	1.3095	1.8191	2.0395	2.4526	2.7440	0.6765	1.2922	1.6624	1.9901	2.3739	2.6387
32	0.6822	1.3086	1.8185	2.0369	2.4487	2.7385	0.6764	1.2921	1.6620	1.9897	2.3733	2.6379
33	0.6820	1.3077	1.8179	2.0345	2.4448	2.7333	0.6763	1.2920	1.6616	1.9893	2.3727	2.6371
34	0.6818	1.3070	1.8174	2.0322	2.4411	2.7284	0.6762	1.2918	1.6612	1.9890	2.3721	2.6364
35	0.6816	1.3062	1.8169	2.0301	2.4377	2.7238	0.6761	1.2916	1.6608	1.9886	2.3716	2.6356
36	0.6814	1.3055	1.8164	2.0281	2.4345	2.7195	0.6760	1.2915	1.6604	1.9883	2.3710	2.6349
37	0.6812	1.3049	1.8159	2.0262	2.4314	2.7154	0.6759	1.2914	1.6600	1.9879	2.3705	2.6342
38	0.6810	1.3042	1.8154	2.0244	2.4286	2.7116	0.6758	1.2913	1.6596	1.9876	2.3700	2.6335
39	0.6808	1.3036	1.8149	2.0227	2.4258	2.7079	0.6757	1.2912	1.6592	1.9873	2.3695	2.6329
40	0.6807	1.3031	1.8144	2.0211	2.4233	2.7045	0.6756	1.2911	1.6588	1.9870	2.3690	2.6322
41	0.6805	1.3025	1.8139	2.0195	2.4208	2.7012	0.6755	1.2910	1.6584	1.9867	2.3685	2.6316
42	0.6804	1.3020	1.8134	2.0181	2.4185	2.6981	0.6754	1.2908	1.6580	1.9864	2.3680	2.6309
43	0.6802	1.3016	1.8129	2.0167	2.4163	2.6951	0.6753	1.2907	1.6576	1.9861	2.3675	2.6303
44	0.6801	1.3011	1.8124	2.0154	2.4141	2.6923	0.6752	1.2906	1.6572	1.9858	2.3671	2.6297
45	0.6800	1.3006	1.8119	2.0141	2.4121	2.6896	0.6751	1.2905	1.6568	1.9855	2.3667	2.6291
46	0.6799	1.3022	1.8114	2.0129	2.4102	2.6870	0.6750	1.2904	1.6564	1.9853	2.3662	2.6286
47	0.6797	1.3018	1.8109	2.0117	2.4083	2.6846	0.6749	1.2903	1.6560	1.9850	2.3658	2.6280
48	0.6796	1.3014	1.8104	2.0106	2.4066	2.6822	0.6748	1.2903	1.6556	1.9847	2.3654	2.6275
							0.6745	1.2886	1.6557	1.9799	2.3646	2.6269
								1.2901	1.6558	1.9842	2.3642	2.6264
								1.2903	1.6558	1.9840	2.3642	2.6259
								1.2893	1.6558	1.9818	2.3642	2.6254
								1.2893	1.6557	1.9818	2.3642	2.6253
								1.2816	1.6549	1.9799	2.3642	2.6258
								1.2816	1.6449	1.9799	2.3642	2.6258

continued

t-分配右尾百分點 t_{α} (d.f.)

For a particular number of degrees of freedom, entry represents the critical value of t corresponding to a specified upper-tail area (α).