Name:
ID:
Discussion Section:

This exam has 20 multiple choice questions worth 5 points each.
Important:

- No graphing calculators!
- For the multiple choice questions, mark your answer on the answer card. This is the only portion of this part of the exam that will be graded.
- Show all your work for the written problems. You will be graded on the ease of reading your solution.
- You are allowed a 3×5 note card for the exam.

1. Compute

$$\int_0^{\pi/4} \sin 2x \, dx + \int_1^e x \ln x \, dx$$

Select the closest answer.

(a) 1.8
(b) 2.0
(c) 2.2
(d) 2.4
(e) 2.6
(f) 2.8
(g) 3.0
(h) 3.2
(i) 3.4
(j) 3.6

Answers for Problems 2, 3:

(a) 40

(b) 60

(c) 80

(d) 100

(e) 120

(f) 140

(g) 160

(h) 180

(i) 220

(j) 240

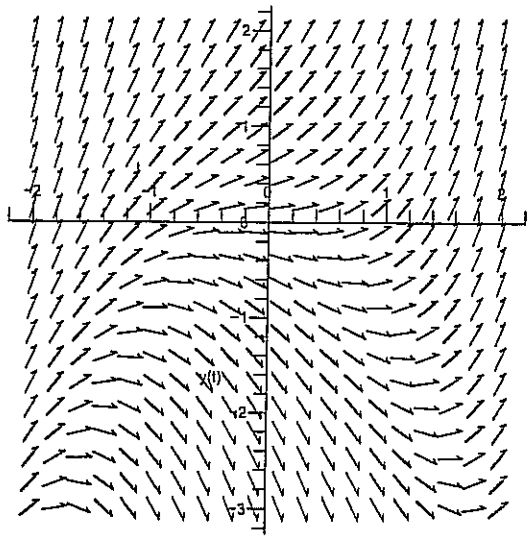
A continuous income stream has rate of income $f(t) = 25e^{-0.02t}$. Money is worth 8% per year (interest rate). The income stream generate income from $t = 0$ to $t = 5$.

(Choose the closest answer.)

2. What is the future value of this income stream.

3. What is the present value of this income stream.

4. Choose the differential equation the gives the slope field graphed below.



(a) $\dfrac{dy}{dt} = y + t^2$

(b) $\dfrac{dy}{dt} = y + t$

(c) $\dfrac{dy}{dt} = y^2 + t$

(d) $\dfrac{dy}{dt} = y - t$

(e) $\dfrac{dy}{dt} = y^2 - t$

(f) $\dfrac{dy}{dt} = y - t^2$

(g) $\dfrac{dy}{dt} = -y + t$

(h) $\dfrac{dy}{dt} = -y + t^2$

(i) $\dfrac{dy}{dt} = -y - t$

(j) $\dfrac{dy}{dt} = -y - t^2$

5. Solve the initial value problem

$$x\frac{dy}{dx} = x + y, \quad y(1) = 3$$

What is $y(2)$. Select the closest answer.

(a) 7.0
(b) 7.2
(c) 7.4
(d) 7.6
(e) 7.8
(f) 8.0
(g) 8.2
(h) 8.4
(i) 8.6
(j) 8.8

6. An initial deposit of \$2,000 is made into an account earning 8% interest, compounded continuously. Money is then continuously withdrawn at a constant rate of \$250 a year until the account is depleted.

In how many years is the account depleated? (Choose the closest answer.)

(a) 12.0 years
(b) 12.1 years
(c) 12.2 years
(d) 12.3 years
(e) 12.4 years
(f) 12.5 years
(g) 12.6 years
(h) 12.7 years
(i) 12.8 years
(j) 12.9 years

7. The function $f(x, y) = x^2 - xy - 4x + y^2 + 5y$ has one critical point, (x_0, y_0).

   If the function has a maximum at this critical point, let $M = 1$.
   If the function has a minimum at this critical point, let $M = -1$.
   If the function has a saddle at this critical point, let $M = 0$.

   What is $f(x_0, y_0) + M$?

   (a) -10
   (b) -9
   (c) -8
   (d) -7
   (e) -6
   (f) -5
   (g) -4
   (h) -3
   (i) -2
   (j) -1

8. The following table shows the percentage of high school senior who admitted to using cocaine at least once.

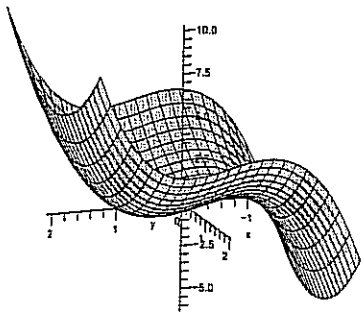
Year	Percentage
1991	6.0
1993	4.9
1995	7.0
1999	9.5

   Find the equation of the least squares line for the data and use that line to predict the percentage of high school seniors admitting to use cocaine in the year 2003.

   Choose the answer closest to your prediction.

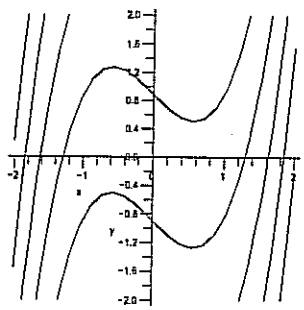
   (a) 11.10
   (b) 11.12
   (c) 11.14
   (d) 11.16
   (e) 11.18
   (f) 11.20
   (g) 11.22
   (h) 11.24
   (i) 11.26
   (j) 11.28

9. For the function $f(x, y) = x^2 - x^4 - y^2$, with the graph given below, find the correct graph of level curves.

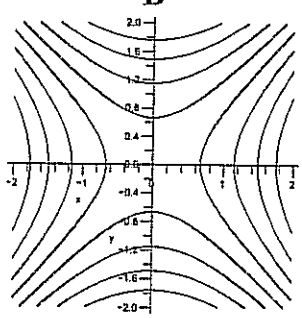


Answers:

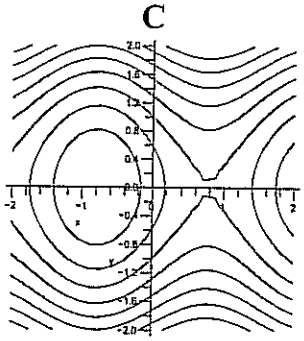
A



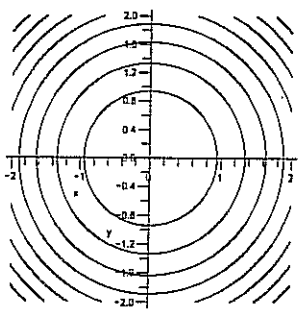
B



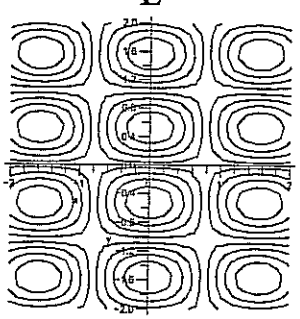
C



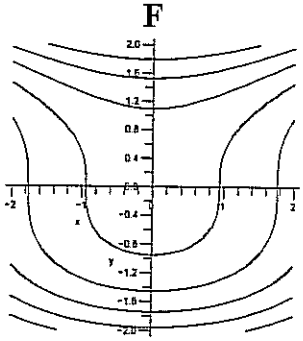
D



E



F



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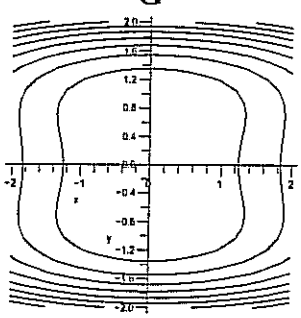
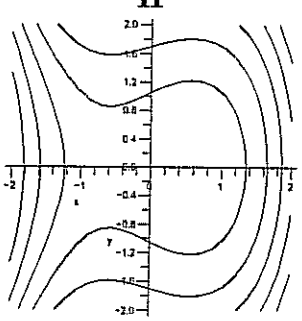
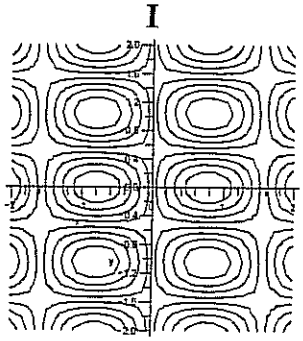


H



I



(j) None of the above.

10. Calculate the volume under the graph of $z = 25 + x^2y - y^2$ and above the rectangle $R = \{(x, y) : 1 \leq x \leq 2, 0 \leq y \leq 3\}$

    Choose the closest answer

    (a) 76.0
    (b) 76.1
    (c) 76.2
    (d) 76.3
    (e) 76.4
    (f) 76.5
    (g) 76.6
    (h) 76.7
    (i) 76.8
    (j) 76.9

11. Let $p_2(x)$ be the second Taylor polynomial, at $x = 2$ for the function $f(x) = x^4$.

    Find $p_2(1)$, choose the closest answer.

    (a) 0
    (b) 1
    (c) 3
    (d) 4
    (e) 6
    (f) 7
    (g) 8
    (h) 10
    (i) 11
    (j) 15

12. Let $f(x) = (x+1)\ln(x+1)$. The Taylor series at $x = 0$ for this function is

$$f(x) = x + \sum_{n=2}^{\infty} a_n x^n$$

What is a formula for a_n?

(a) $(-1)^n n$
(b) $(-1)^n n^2$
(c) $\dfrac{(-1)^{n+1}}{n}$
(d) $\dfrac{(-1)^n}{n^2}$
(e) $\dfrac{(-1)^n}{n-1}$
(f) $\dfrac{(-1)^n}{n(n+1)}$
(g) $\dfrac{(-1)^{n+1}}{n(n+1)}$
(h) $\dfrac{(-1)^n}{n(n-1)}$
(i) $\dfrac{(-1)^{n+1}}{n(n-1)}$
(j) None of the above

13. Find the sum of the geometric series

$$8 + 7 + \cdots$$

Choose the closest answer.

(a) 15
(b) 21
(c) 26
(d) 31
(e) 35
(f) 48
(g) 60
(h) 64
(i) 128
(j) Series Diverges

14. The weights of healthy 10-week old kittens follows a normal distribution with a mean weight of 24.5 ounces and a standard deviation of 5.25 ounces. What proportion of these kittens weigh less than 20 ounces?

    Choose the closest answer.

    (a) 0.000
    (b) 0.191
    (c) 0.195
    (d) 0.201
    (e) 0.203
    (f) 0.297
    (g) 0.300
    (h) 0.305
    (i) 0.309
    (j) 0.500

15. The scores on an exam are normally distributed with a mean of 57 and standard deviation of 12. Grades are assigned as follows.

    The top 10% of the class receive an A. The next 25% of the class receive a B. The next 25% of the class receive a C. The next 20% of the class receive a D. The bottom 20% of the class fail with an F.

    What is the lowest score that can receive a C?

    Choose the closest answer.

    (a) 53.8
    (b) 53.9
    (c) 54.0
    (d) 54.1
    (e) 54.2
    (f) 54.4
    (g) 54.5
    (h) 54.6
    (i) 54.7
    (j) 54.8

16. The lifespan of a certain computer hard drive is an exponential random variable with average lifespan of 72 months. What proportion of these hard drives last 80 or more months?

    Choose the closest answer.

    (a) 0.28
    (b) 0.30
    (c) 0.31
    (d) 0.33
    (e) 0.35
    (f) 0.50
    (g) 0.65
    (h) 0.67
    (i) 0.69
    (j) 0.70

17. The time, in minutes, that a customer must wait in line at a grocery store is an exponential random variable. Suppose that the probability a customer waits in line more than 8 minutes is 0.20. Find the average waiting time, in minutes.

    Choose the closest answer

    (a) 1 minutes
    (b) 2 minutes
    (c) 3 minutes
    (d) 5 minutes
    (e) 7 minutes
    (f) 9 minutes
    (g) 10 minutes
    (h) 12 minutes
    (i) 16 minutes
    (j) 22 minutes

18. A continuous random variable, X, has probability density function.

$$f(x) = \begin{cases} 0 & \text{if } x < 0 \\ \frac{x}{18} & \text{if } 0 \leq x \leq 6 \\ 0 & \text{if } x > 6 \end{cases}$$

Find $E(X) + V(X)$.

Choose the closest answer.

(a) 0
(b) 1
(c) 2
(d) 3
(e) 4
(f) 5
(g) 6
(h) 7
(i) 8
(j) 9

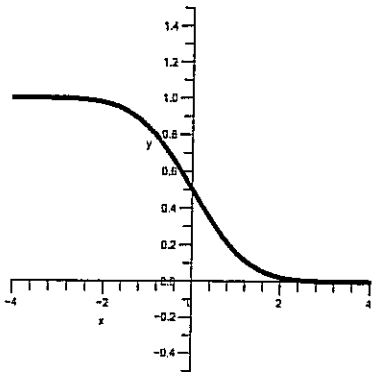
19. Find k so that the following is a probability density function

$$f(x) = \begin{cases} 0 & \text{if } x < 1 \\ \frac{1}{4} & \text{if } 1 \leq x \leq 2 \\ 0 & \text{if } 2 < x < 3 \\ k & \text{if } 3 \leq x \leq 5 \\ 0 & \text{if } x > 5 \end{cases}$$

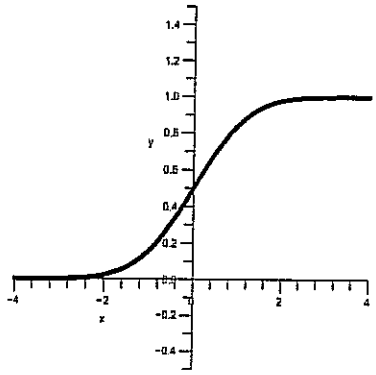
(a) 0
(b) $\frac{1}{8}$
(c) $\frac{2}{8}$
(d) $\frac{3}{8}$
(e) $\frac{4}{8}$
(f) $\frac{5}{8}$
(g) $\frac{6}{8}$
(h) $\frac{7}{8}$
(i) 1
(j) None of the above or f can not be made into a probability density function

20. Which of the following graphs are possible cumulative distribution functions?

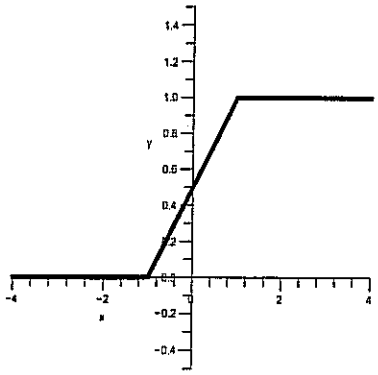
Graph I:



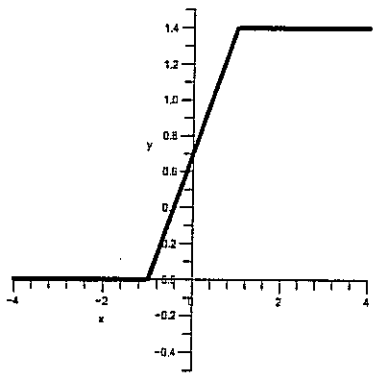
Graph II:



Graph III:



Graph IV:



(a) None of the above are possible cdfs

(b) I only

(c) II only

(d) III only

(e) IV only

(f) Exactly two of the above

(g) Exactly three of the above

(h) All of the above are possible cdfs

Area Under the Standard Normal Curve ($\mu = 0$, $\sigma = 1$) From 0 to z

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
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998
3.5	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998
3.6	0.4998	0.4998	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.7	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.8	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.9	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000