

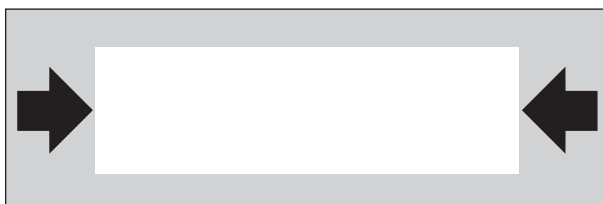
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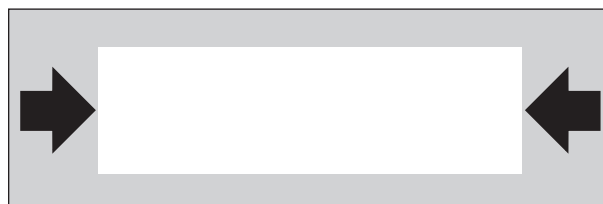
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Principles of Mathematics 12

January 2002

Course Code = MA

### Student Instructions

1. Place the stickers with your Personal Education Number (PEN) in the allotted spaces above. **Under no circumstance is your name or identification, other than your Personal Education Number, to appear on this booklet.**
2. Ensure that in addition to this examination booklet, you have an **Examination Response Form**. Follow the directions on the front of the Response Form.
3. **Disqualification** from the examination will result if you bring books, paper, notes or unauthorized electronic devices into the examination room.
4. When instructed to open this booklet, **check the numbering of the pages** to ensure that they are numbered in sequence from page one to the last page, which is identified by **END OF EXAMINATION**.
5. At the end of the examination, place your Response Form inside the front cover of this booklet and return the booklet and your Response Form to the supervisor.

Question 1:  
1.  .   
(5)

Question 4:  
8.  .   
(5)

Question 2a:  
2.  .   
(1)

Question 5a:  
9.  .   
(2)

Question 2b:  
3.  .   
(1)

Question 5b:  
10.  .   
(2)

Question 2c:  
4.  .   
(1)

Question 5c:  
11.  .   
(1)

Question 2d:  
5.  .   
(1)

Question 6:  
12.  .   
(5)

Question 2e:  
6.  .   
(1)

Question 7:  
13.  .   
(4)

Question 3:  
7.  .   
(5)



# **PRINCIPLES OF MATHEMATICS 12**

**January 2002**

COURSE CODE = MA

## GENERAL INSTRUCTIONS

1. Aside from an approved calculator, electronic devices, including dictionaries and pagers, are **not** permitted in the examination room.
2. All multiple-choice answers must be entered on the Response Form using an **HB pencil**. Multiple-choice answers entered in this examination booklet will **not** be marked.
3. For each of the written-response questions, write your answer in the space provided in this booklet.

You will not be provided with any additional paper since rough-work space for the written-response questions has been incorporated into the space allowed for answering each question. You may not need all of the space provided to answer each question.

4. Ensure that you use language and content appropriate to the purpose and audience of this examination. Failure to comply may result in your paper being awarded a zero.
5. This examination is designed to be completed in **two hours**. *Students may, however, take up to 30 minutes of additional time to finish.*

## PRINCIPLES OF MATHEMATICS 12 PROVINCIAL EXAMINATION

- |   | Value                   | Suggested Time     |
|---|-------------------------|--------------------|
| 1. This examination consists of <b>two</b> parts: |                         |                    |
| PART A: 44 multiple-choice questions              | 66                      | 75                 |
| PART B: 7 written-response questions              | 34                      | 45                 |
|   | <b>Total: 100 marks</b> | <b>120 minutes</b> |
2. The last **four** pages inside the back cover contain **A Summary of Basic Identities and Formulae, The Standard Normal Distribution Table, Rough Work for Graphing, and Rough Work for Multiple-Choice**. These pages may be detached for convenient reference prior to writing this examination.
3. **A graphing calculator is essential for the Principles of Mathematics 12 Provincial Examination.** The calculator must be a hand-held device designed primarily for mathematical computations involving logarithmic and trigonometric functions, for graphing functions and for performing statistical tests. Computers, calculators with a QWERTY keyboard or symbolic manipulation abilities; such as the Computer Algebraic System (CAS) and electronic writing pads will not be allowed. Students must not bring any external devices (peripherals) to support calculators such as manuals, printed or electronic cards, printers, memory expansion chips or cards, CD-ROMs, libraries or external keyboards. Students may have more than one calculator available during the examination, of which one may be a scientific calculator. Calculators may not be shared and must not have the ability to either transmit or receive electronic signals. In addition to an approved calculator, students will be allowed to use rulers, compasses, and protractors during the examination.
- Calculators must not have any information programmed into the memory which would not be acceptable in paper form.* Specifically, calculators must not have any built-in notes, definitions, or libraries. There is no requirement to clear memories at the beginning of the examination but the use of calculators with built-in notes is equivalent to the use of notes in paper form. Any student deemed to have cheated on a provincial examination will receive a “0” on that examination and will be permanently disqualified from the Provincial Examination Scholarship Program.
4. If, in a justification, you refer to information produced by the graphing calculator, this information must be presented clearly in the response. For example, if a graph is used in the solution of the problem, it is important to sketch the graph, showing its general shape and indicating the appropriate values. If the statistical features of the calculator are used, it is important to show the function with the substitution of the relevant numbers. For example: in part of the solution you may show  $\text{normalcdf}(40, 50, 47, 10)$  or the equivalent syntax for your calculator.
5. When using the calculator, you should provide a decimal answer that is correct to **at least two decimal places** (unless otherwise indicated). Such rounding should occur **only** in the final step of the solution.

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**PART A: MULTIPLE CHOICE**

**Value: 66 marks**

**Suggested Time: 75 minutes**

**INSTRUCTIONS:** For each question, select the **best** answer and record your choice on the Response Form provided. Using an HB pencil, completely fill in the circle that has the letter corresponding to your answer.

1. Convert 5.3 radians to degrees.

- A.  $0.09^\circ$
- B.  $0.18^\circ$
- C.  $151.83^\circ$
- D.  $303.67^\circ$

2. Determine the period of  $y = 6 \cos \frac{2\pi}{15}x + 8$ .

- A.  $\frac{2}{15}$
- B.  $\frac{15}{2}$
- C. 15
- D. 30

3. Determine the exact value of  $\tan \frac{5\pi}{6}$ .

- A.  $-\frac{\sqrt{3}}{2}$
- B.  $-\frac{1}{\sqrt{3}}$
- C.  $\frac{1}{\sqrt{3}}$
- D.  $\frac{\sqrt{3}}{2}$

4. The point  $P(m, n)$  is the intersection point of the terminal arm of angle  $\theta$  in standard position and the unit circle  $x^2 + y^2 = 1$ . Which expression represents  $\sin \theta$  ?
- A.  $m$
  - B.  $n$
  - C.  $\frac{m}{n}$
  - D.  $\frac{n}{m}$
5. Which of the following is an asymptote of  $y = \sec x$  ?
- A.  $x = 0$
  - B.  $x = \frac{\pi}{4}$
  - C.  $x = \frac{\pi}{2}$
  - D.  $x = \pi$
6. Simplify:  $\frac{\sin 2\theta}{\sin \theta}$
- A. 2
  - B.  $\sin \theta$
  - C.  $\cos \theta$
  - D.  $2 \cos \theta$
7. Which expression is equivalent to  $\frac{\cos x + \cot x}{\sin x + 1}$  ?
- A.  $\sec x$
  - B.  $\csc x$
  - C.  $\cot x$
  - D.  $\tan x$



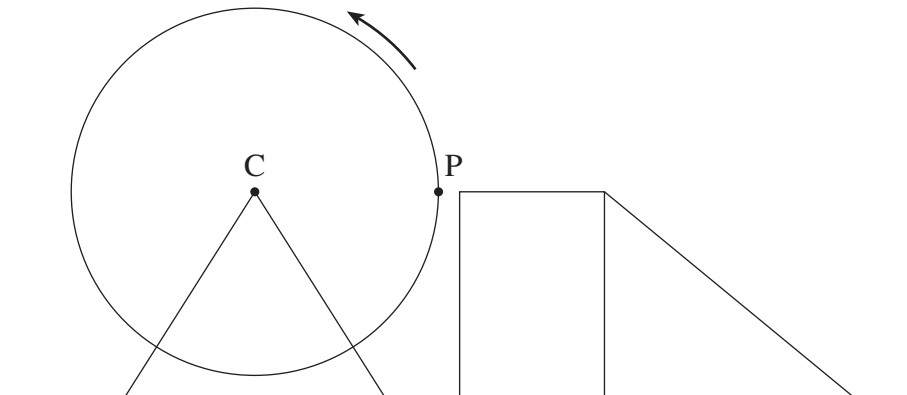
8. Which expression is equivalent to  $\sin\left(x + \frac{\pi}{3}\right) + \sin\left(x - \frac{\pi}{3}\right)$ ?

- A.  $\frac{\sqrt{3}}{4} \sin x$
- B.  $\sin x$
- C.  $\sqrt{3} \sin x$
- D.  $2 \sin x$

9. Solve:  $\sin 3x + \tan x = 3$ ,  $0 \leq x < 2\pi$

- A. 1.31, 4.34
- B. 2.44, 3.85
- C. 1.31, 1.57, 4.34, 4.71
- D. 0, 2.44, 3.14, 3.85

10. A Ferris wheel has a radius of 18 metres and a centre C which is 20 m above the ground. It rotates once every 32 seconds in the direction shown in the diagram. A platform allows a passenger to get on the Ferris wheel at a point P which is 20 m above the ground. If the ride begins at point P, when the time  $t = 0$  seconds, determine a sine function that gives the passenger's height,  $h$ , in metres, above the ground as a function of  $t$ .



- A.  $h(t) = 18 \sin \frac{\pi}{16} t + 20$
- B.  $h(t) = 18 \sin \frac{\pi}{32} t + 20$
- C.  $h(t) = 20 \sin \frac{\pi}{16} t + 18$
- D.  $h(t) = 20 \sin \frac{\pi}{32} t + 18$

11. Determine the common ratio of the geometric sequence 8, 12, 18, 27, ...

A.  $\frac{2}{3}$

B.  $\frac{4}{3}$

C.  $\frac{3}{2}$

D. 4

12. An aquarium originally containing 30 litres of water loses 6% of its water to evaporation every day. Determine a geometric sequence which shows the number of litres of water in the aquarium on consecutive days.

A. 30,  $30(0.94)$ ,  $30(0.94)^2$ ,  $30(0.94)^3$ , ...

B. 30,  $30(0.06)$ ,  $30(0.06)^2$ ,  $30(0.06)^3$ , ...

C. 30,  $\frac{30}{1.06}$ ,  $\frac{30}{(1.06)^2}$ ,  $\frac{30}{(1.06)^3}$ , ...

D. 30,  $\frac{30}{0.94}$ ,  $\frac{30}{(0.94)^2}$ ,  $\frac{30}{(0.94)^3}$ , ...

13. Which term of the geometric sequence 5, 15, 45, ... is 885 735 ?

A. 10<sup>th</sup>

B. 11<sup>th</sup>

C. 12<sup>th</sup>

D. 13<sup>th</sup>

14. Determine an expression which represents:  $\sum_{k=1}^n 4(5)^{k-1}$

A.  $4(5)^n$

B.  $4(5)^{n-1}$

C.  $1 - 5^n$

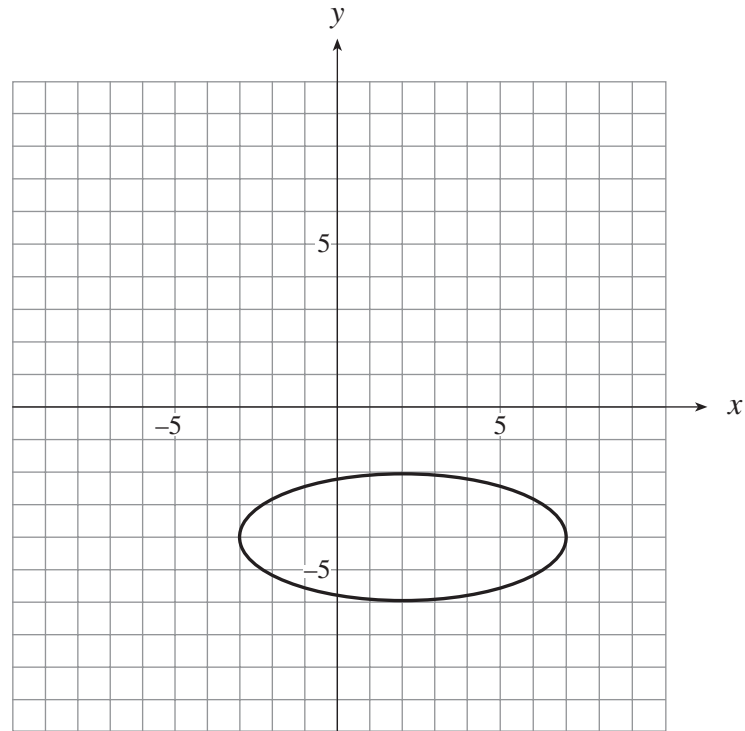
D.  $5^n - 1$

15. A ball is dropped from a height of 5 m. After each bounce, it rises to 60% of its previous height. What is the total vertical distance the ball travels before it comes to rest?
- A. 12.5 m
  - B. 15 m
  - C. 20 m
  - D. 25 m
16. Change to logarithmic form:  $p = q^r$
- A.  $\log_p q = r$
  - B.  $\log_q p = r$
  - C.  $\log_r p = q$
  - D.  $\log_q r = p$
17. Evaluate:  $\log_2 7.5$
- A. 0.44
  - B. 0.57
  - C. 2.26
  - D. 2.91
18. Determine the range of the function  $y = 2^{x-3} + 4$ .
- A.  $y > 4$
  - B.  $y > -4$
  - C.  $x > 3$
  - D.  $x > -3$
19. Solve:  $16^{x+1} = 8^{1-x}$
- A.  $-\frac{1}{3}$
  - B.  $-\frac{1}{7}$
  - C.  $\frac{2}{7}$
  - D.  $\frac{2}{5}$

**OVER**

20. Which expression is equivalent to  $\log\left(\frac{100x^3}{y}\right)$ ?
- A.  $2 + \log(3x - y)$
  - B.  $300 \log x - \log y$
  - C.  $2 + 3 \log x - \log y$
  - D.  $\log(100 + x^3 - y)$
21. Solve:  $\log_3(x + 4) + \log_3(6 - x) = 2$
- A. 3
  - B. 5
  - C. 3, -5
  - D. 5, -3
22. Simplify:  $a^{\log_a 8 + \log_a 2}$
- A. 10
  - B. 16
  - C.  $a^{10}$
  - D.  $a^{16}$
23. Determine the radius of the circle:  $(x - 5)^2 + (y + 8)^2 = 100$
- A. 10
  - B. 25
  - C. 50
  - D. 100
24. Determine the distance between the vertices of  $\frac{(x - 3)^2}{25} - \frac{(y - 4)^2}{9} = 1$ .
- A. 3
  - B. 5
  - C. 6
  - D. 10

25. Determine the equation of the conic graphed below.



- A.  $\frac{(x+2)^2}{4} + \frac{(y-4)^2}{25} = 1$
- B.  $\frac{(x-2)^2}{4} + \frac{(y+4)^2}{25} = 1$
- C.  $\frac{(x+2)^2}{25} + \frac{(y-4)^2}{4} = 1$
- D.  $\frac{(x-2)^2}{25} + \frac{(y+4)^2}{4} = 1$

OVER

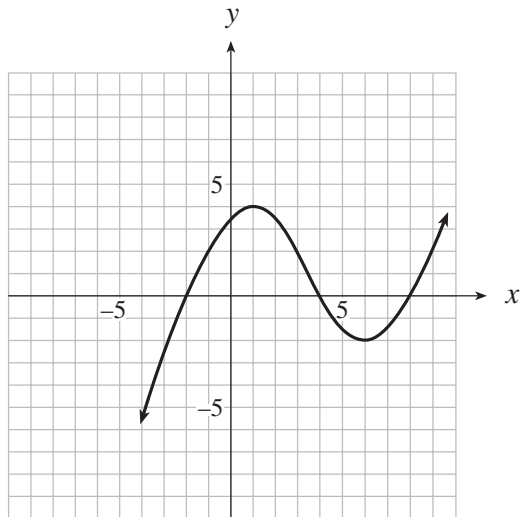
26. Determine the restrictions on the constants  $A$ ,  $C$  and  $E$  such that the following equation is a parabola with a vertical axis of symmetry.

$$Ax^2 + Cy^2 + x + Ey = 0$$

- A.  $A = 0$ ,  $C \neq 0$ ,  $E \neq 0$   
B.  $A = 0$ ,  $C \neq 0$ ,  $E = 0$   
C.  $A \neq 0$ ,  $C = 0$ ,  $E = 0$   
D.  $A \neq 0$ ,  $C = 0$ ,  $E \neq 0$
27. Which equation represents the graph of  $y = \sqrt{x}$  after it is translated 4 units to the right?
- A.  $y = \sqrt{x} - 4$   
B.  $y = \sqrt{x - 4}$   
C.  $y = \sqrt{x + 4}$   
D.  $y = \sqrt{x} + 4$
28. If  $f(x) = 5x - 1$ , determine the equation of  $f^{-1}(x)$ , the inverse of  $f(x)$ .

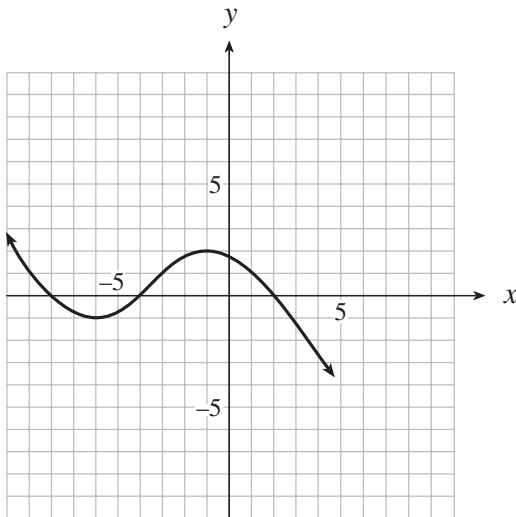
- A.  $f^{-1}(x) = \frac{1}{5x - 1}$   
B.  $f^{-1}(x) = \frac{1}{5}x - 1$   
C.  $f^{-1}(x) = \frac{x + 1}{5}$   
D.  $f^{-1}(x) = \frac{x - 1}{5}$

29. The graph of  $y = f(x)$  is shown below.

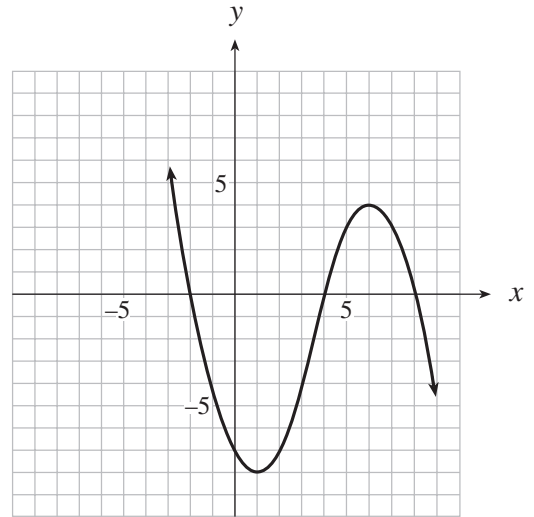


Which of the following graphs represents  $y = -2f(x)$  ?

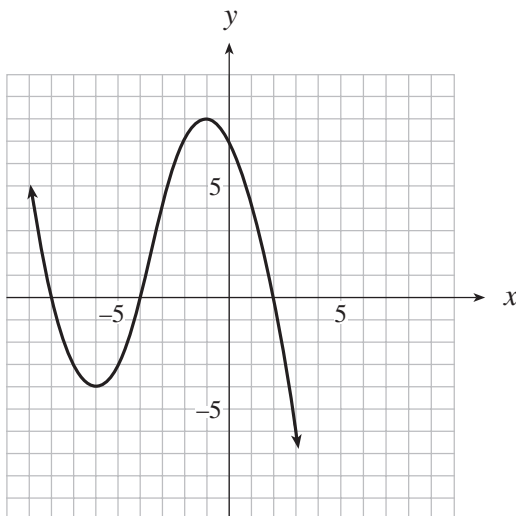
A.



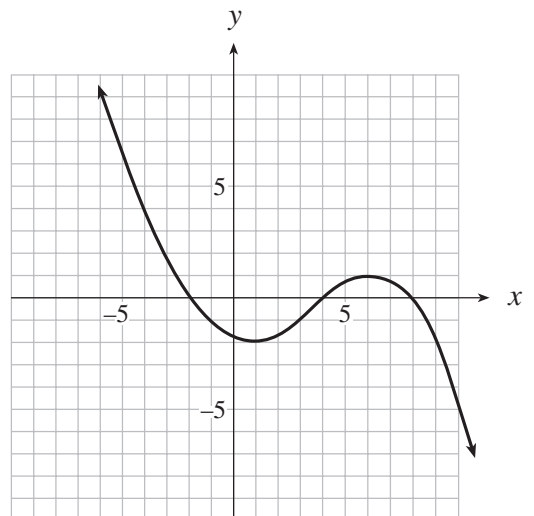
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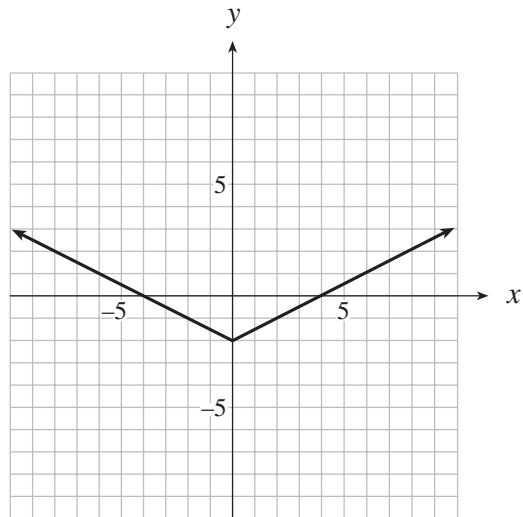


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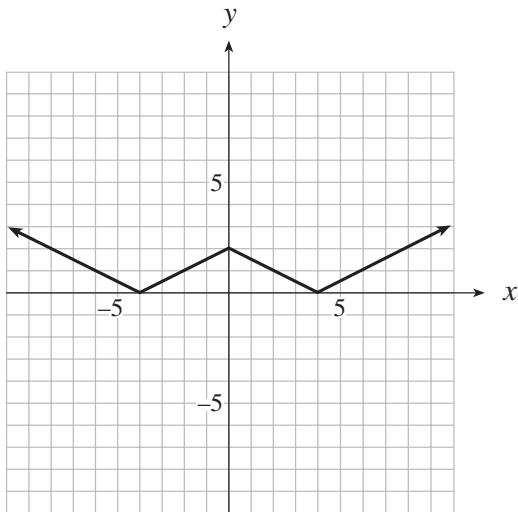
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30. The graph of  $y = f(x)$  is shown below.

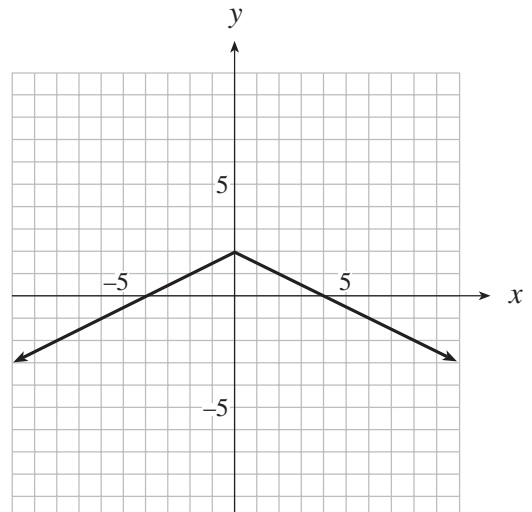


Which of the following graphs represents  $y = \frac{1}{f(x)}$  ?

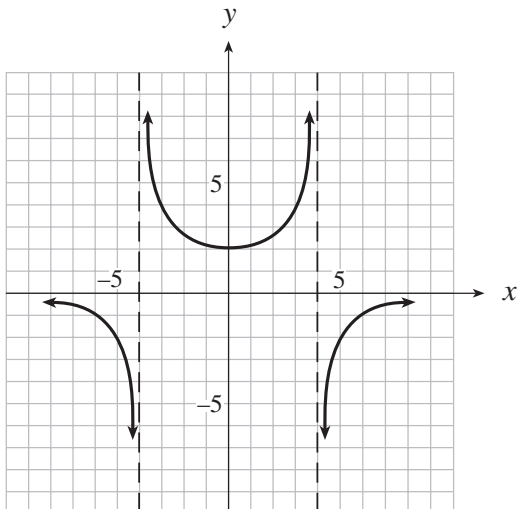
A.



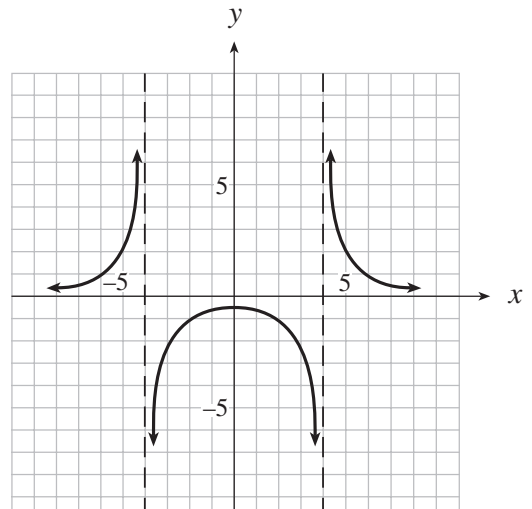
B.



C.



D.





31. Which equation represents the graph of  $y = x^3 + x^2$  after it is reflected in the y-axis?
- A.  $y = -x^3 + x^2$
  - B.  $y = -x^3 - x^2$
  - C.  $y = \frac{1}{x^3 + x^2}$
  - D.  $x = y^3 + y^2$
32. When you play lotto 5-30, you must choose 5 different integers from 1 to 30. How many combinations are possible?
- A.  $\frac{30!}{5!25!}$
  - B.  $\frac{30!}{25!}$
  - C.  $25!$
  - D.  $\frac{30!}{5!}$
33. Determine the 4<sup>th</sup> term of  $(x - 2)^6$ .
- A.  $120x^2$
  - B.  $240x^2$
  - C.  $-160x^3$
  - D.  $-320x^3$
34. Determine the number of different arrangements of all the letters in APPLEPIE.
- A. 3 360
  - B. 6 720
  - C. 40 312
  - D. 40 320

35. Assume a car license plate consists of 7 characters. The first 3 characters can be any of the letters from A to F, but no letter can be repeated. The next 3 characters can be any of the digits from 1 to 9, but no digit can be repeated. The last character can be any of the letters X, Y or Z. An example of this format is: BFA648Y. How many license plates are possible?

- A. 5 040
- B. 181 440
- C. 472 392
- D. 4 084 080

36. If  $P(N) = \frac{1}{4}$ , determine  $P(\bar{N})$ .

- A.  $-\frac{1}{4}$
- B.  $\frac{1}{4}$
- C.  $\frac{3}{4}$
- D. 4

37. When you toss a fair die three times, what is the probability that you will get a 5 on the first toss, a 6 on the second toss, and any number except a 2 on the last toss?

- A.  $\frac{1}{6} \cdot \frac{1}{6} \cdot \frac{1}{6}$
- B.  $\frac{1}{6} + \frac{1}{6} + \frac{1}{6}$
- C.  $\frac{1}{6} \cdot \frac{1}{6} \cdot \frac{5}{6}$
- D.  $\frac{1}{6} + \frac{1}{6} + \frac{5}{6}$

38. A pizza restaurant conducted a survey on its customers' choice of pizza toppings. The results of this survey were:

63% chose ham  
26% chose pepperoni  
18% chose both

What is the probability that a customer selected at random from the survey did not choose ham or pepperoni?

- A. 11%  
B. 29%  
C. 53%  
D. 82%
39. If 5 people are randomly selected from a group of 4 boys and 5 girls, determine the probability that exactly 3 girls are selected.
- A. 0.08  
B. 0.13  
C. 0.30  
D. 0.48
40. Calculate the standard deviation of the population of heights shown in the following frequency table.

Height (cm)	Frequency
23	4
24	9
25	9
26	7
27	6

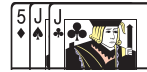
- A. 1.26 cm  
B. 1.41 cm  
C. 1.85 cm  
D. 1.90 cm

41. The results of a district-wide science test were normally distributed with a mean of 80 and a standard deviation of 16. Determine the percent of scores that would be expected to be between 70 and 90.

- A. 27%
- B. 40%
- C. 47%
- D. 73%

42. Suppose you play a game of cards in which only three cards are dealt from a standard 52-card deck. How many ways are there to obtain one pair? (2 cards of the same rank and 1 card of a different rank.)

An example of a hand that contains one pair is 2 jacks and 1 five.

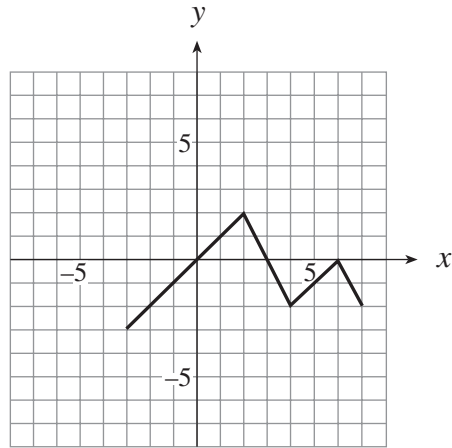


- A. 1 014
- B. 1 872
- C. 3 744
- D. 3 900

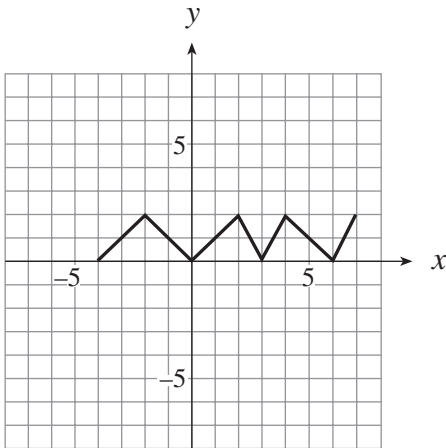
43. The population of a city grows continuously according to the formula  $P = P_0 e^{kt}$ . Determine the value of the growth rate,  $k$ , if the population increases from 30 000 to 45 000 in 8 years.

- A. 0.02
- B. 0.05
- C. 0.41
- D. 1.05

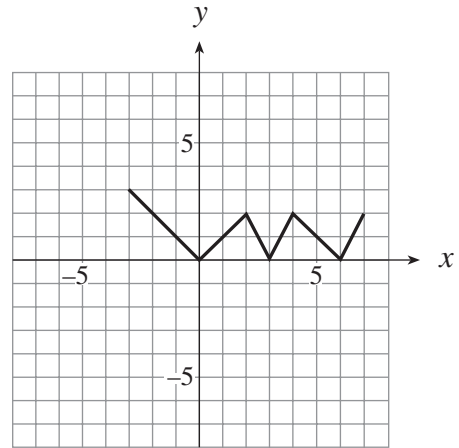
44. The graph of Math Mountain,  $y = m(x)$  is shown below.



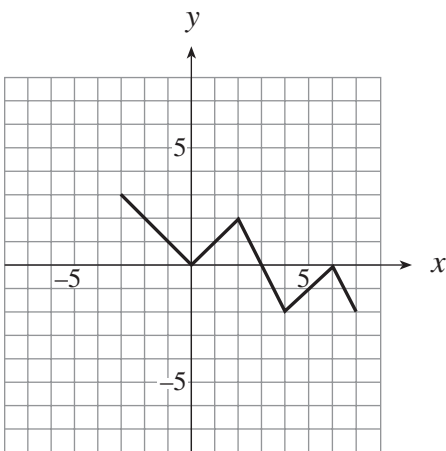
Which of the following graphs represents  $y = m(|x|)$  ?



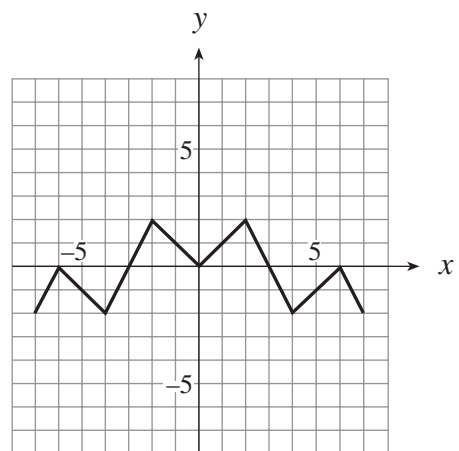
B.



C.



D.



**This is the end of the multiple-choice section.  
Answer the remaining questions directly in this examination booklet.**

**OVER**

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## PART B: WRITTEN RESPONSE

Value: 34 marks

Suggested Time: 45 minutes

**INSTRUCTIONS:** Rough-work space has been incorporated into the space allowed for answering each question. You may not need all the space provided to answer each question. Where required, place the final answer for each question in the space provided.

If, in a justification, you refer to information produced by the graphing calculator, this information must be presented clearly in the response. For example, if a graph is used in the solution of the problem, it is important to sketch the graph, showing its general shape and indicating the appropriate values. If the statistical features of the calculator are used, it is important to show the function with the substitution of the relevant numbers. For example: in part of the solution you may show  $\text{normalcdf}(40, 50, 47, 10)$  or the equivalent syntax for your calculator.

When using the calculator, you should provide a decimal answer that is correct to **at least two decimal places** (unless otherwise indicated). Such rounding should occur **only** in the final step of the solution.

**Full marks will NOT be given for the final answer only.**

1. Change to standard form:  $9x^2 - 16y^2 - 36x - 96y - 252 = 0$

**(5 marks)**



ANSWER:

2. A tetrahedral die has four sides numbered 1, 2, 3 and 4. Two tetrahedral dice are rolled. The sample space is shown below.

		2nd die			
		1	2	3	4
1st die	1	(1, 1)	(1, 2)	(1, 3)	(1, 4)
	2	(2, 1)	(2, 2)	(2, 3)	(2, 4)
	3	(3, 1)	(3, 2)	(3, 3)	(3, 4)
	4	(4, 1)	(4, 2)	(4, 3)	(4, 4)

Determine the probability that:

- a) the sum of the two dice is equal to 6.

**(1 mark)**

ANSWER:

- b) the product of the two dice is a multiple of 3.

**(1 mark)**

ANSWER:

- c) the number showing up on the first die is greater than the number showing up on the second die. **(1 mark)**

ANSWER:

- d) the sum of the two dice is equal to 6 or the product of the two dice is a multiple of 3. **(1 mark)**

ANSWER:

- e) the first die is a 4 given that the sum of the two dice is equal to 6. **(1 mark)**

ANSWER:

**OVER**

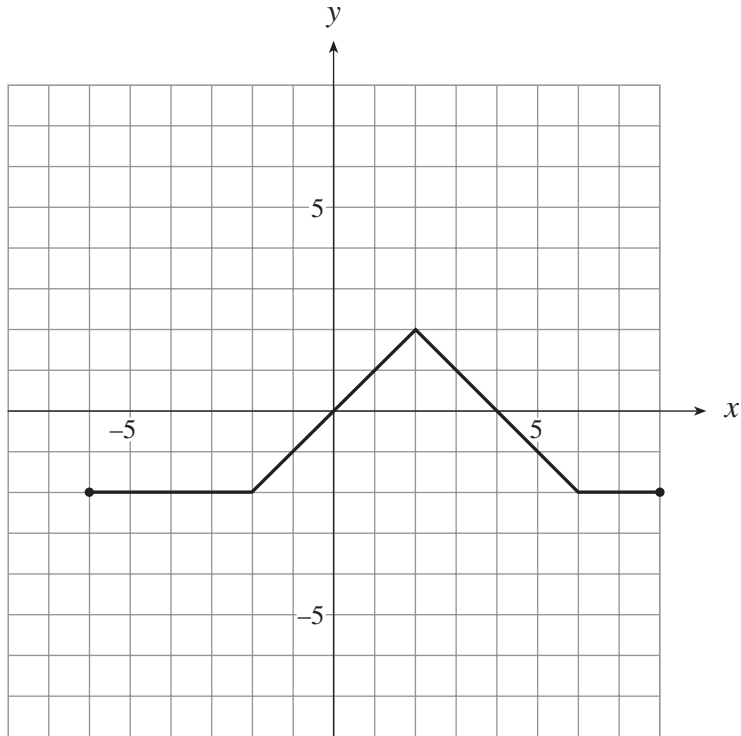
3. Strontium-90 is a radioactive substance with a half-life of 28 days. How many days will it take for a 200 gram sample of strontium-90 to be reduced to 8 grams? (Solve algebraically using logarithms.)  
**(5 marks)**

ANSWER:

4. Solve  $2 \cos^2 x + \cos x - 1 = 0$  algebraically over the set of real numbers. (Give the general solution using exact values.) **(5 marks)**

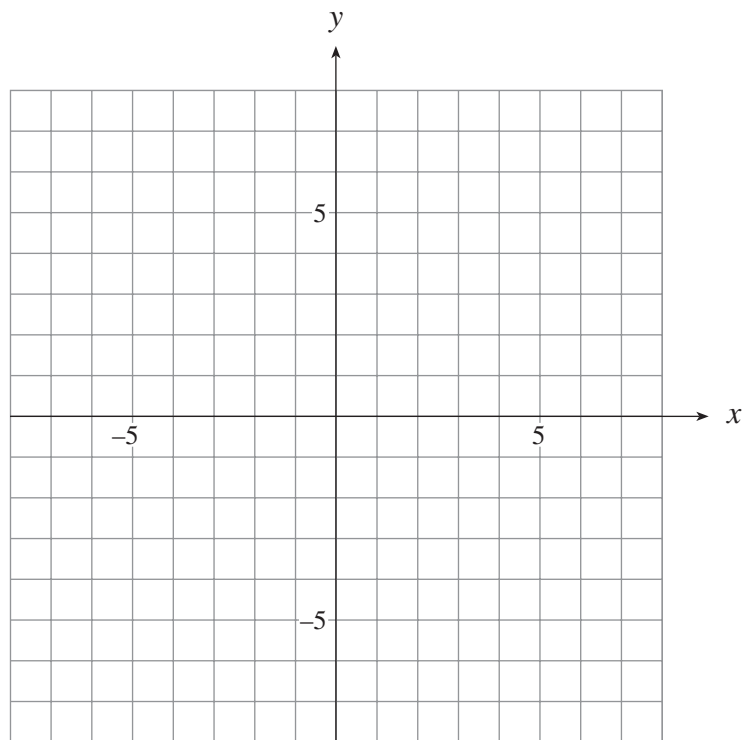
ANSWER:

5. The graph of  $y = f(x)$  is shown below.



On the grids provided, sketch the graphs of:

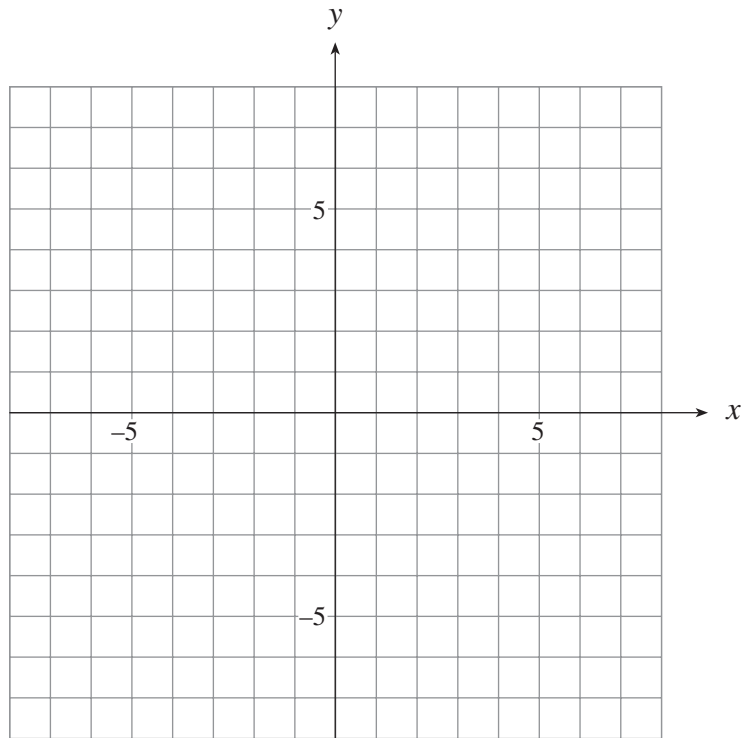
a)  $y = f(x + 2) - 3$  (2 marks)





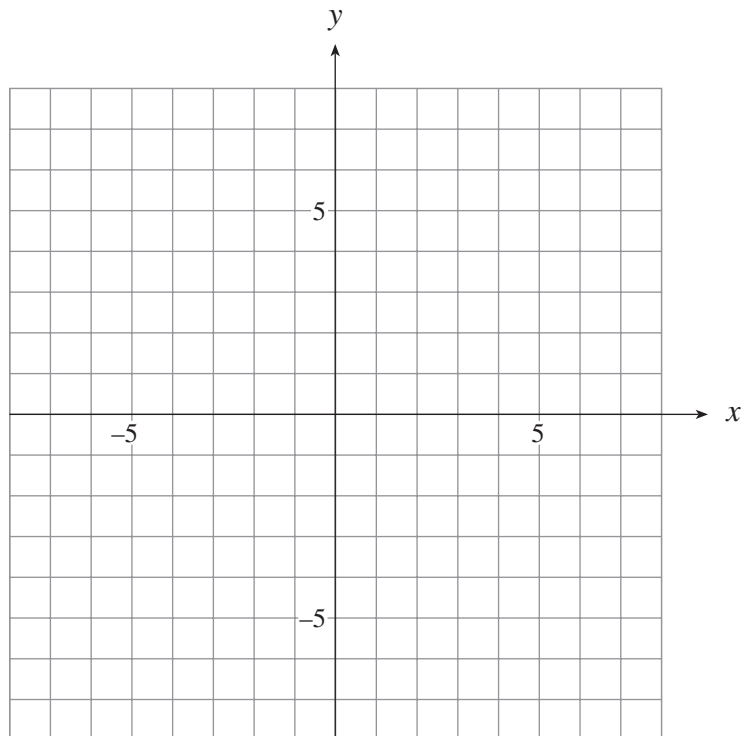
b)  $y = f(2x)$

**(2 marks)**



c)  $y = |f(2x)|$

**(1 mark)**



6. In a sequence, if  $t_n = \sum_{k=1}^n \left(\frac{1}{x}\right)^{k-1} + \sum_{k=1}^n \left(-\frac{1}{x}\right)^{k-1}$ , determine the value of  $t_4$  if  $x = 3$ . **(5 marks)**

ANSWER:

7. In a large city the probability that a grade 12 student has a part time job is 0.40. Use the normal approximation to the binomial to determine the probability that in a random sample of 60 grade 12 students at least 20 of them have a part time job. (Show all solution steps. If using a calculator, clearly show the function used and the substitution of the numbers into this function.) **(4 marks)**

ANSWER:

**END OF EXAMINATION**

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## A SUMMARY OF BASIC IDENTITIES AND FORMULAE

### Pythagorean Identities:

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$1 + \tan^2 \theta = \sec^2 \theta$$

$$1 + \cot^2 \theta = \csc^2 \theta$$

### Reciprocal and Quotient Identities:

$$\sec \theta = \frac{1}{\cos \theta}$$

$$\csc \theta = \frac{1}{\sin \theta}$$

$$\cot \theta = \frac{1}{\tan \theta}$$

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$\cot \theta = \frac{\cos \theta}{\sin \theta}$$

### Addition Identities:

$$\cos(\alpha + \beta) = \cos \alpha \cos \beta - \sin \alpha \sin \beta$$

$$\tan(\alpha + \beta) = \frac{\tan \alpha + \tan \beta}{1 - \tan \alpha \tan \beta}$$

$$\cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$$

$$\sin(\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta$$

$$\tan(\alpha - \beta) = \frac{\tan \alpha - \tan \beta}{1 + \tan \alpha \tan \beta}$$

$$\sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$$

### Double-Angle Identities:

$$\cos 2\theta = \cos^2 \theta - \sin^2 \theta$$

$$\sin 2\theta = 2 \sin \theta \cos \theta$$

$$= 2 \cos^2 \theta - 1$$

$$= 1 - 2 \sin^2 \theta$$

$$\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$$

### Formulae:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$t_n = ar^{n-1}$$

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$S_n = \frac{a(1-r^n)}{1-r}$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$

$$S_n = \frac{a - \ell r}{1-r}$$

$$S = \frac{a}{1-r}$$

You may detach this page for convenient reference.  
Exercise care when tearing along perforations.

## A SUMMARY OF BASIC IDENTITIES AND FORMULAE

### Probability and Statistics:

$${}_n P_r = \frac{n!}{(n-r)!}$$

$${}_n C_r = \binom{n}{r} = \frac{n!}{r!(n-r)!}$$

$$t_{k+1} = {}_n C_k a^{n-k} b^k$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$P(A|B) = \frac{P(A \text{ and } B)}{P(B)}$$

$$P(A \text{ and } B) = P(A) \times P(B|A)$$

$$P(\bar{A}) = 1 - P(A)$$

$$\mu = \frac{\sum x_i}{n}$$

$$\sigma = \sqrt{\frac{\sum (x_i - \mu)^2}{n}}$$

$$\mu = np$$

$$\sigma = \sqrt{npq} \quad (q = 1 - p)$$

$$z = \frac{x - \mu}{\sigma}$$

$$\text{margin of error} \approx z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p}\hat{q}}{n}}$$

$$\text{standard error} \approx \sqrt{\frac{\hat{p}\hat{q}}{n}}$$

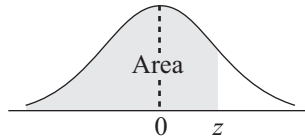
$$\hat{p} - z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p}\hat{q}}{n}} < p < \hat{p} + z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p}\hat{q}}{n}}$$



Graphing calculators will contain many of these formulae as pre-programmed functions.



# THE STANDARD NORMAL DISTRIBUTION TABLE



$$F_z(z) = P[Z \leq z]$$

$z$	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
-3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
-3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
-3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
-3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
-2.9	0.0019	0.0018	0.0017	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-1.8	0.0359	0.0352	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0722	0.0708	0.0694	0.0681
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
-0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641

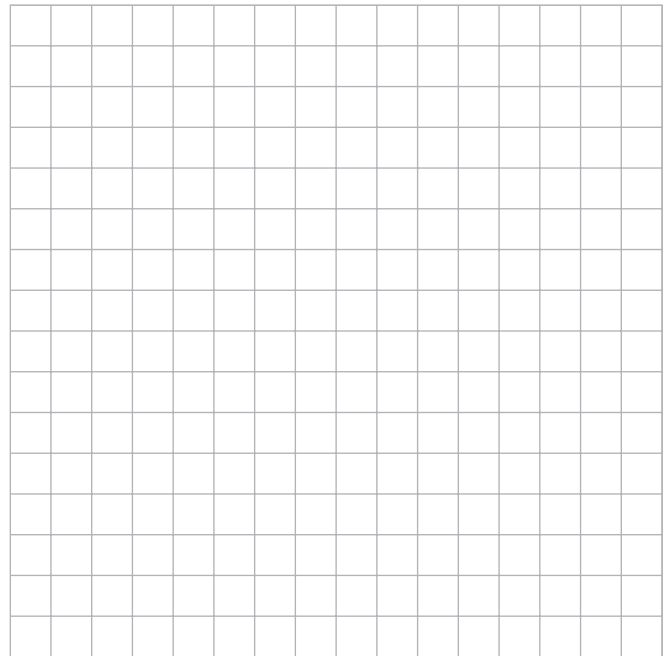
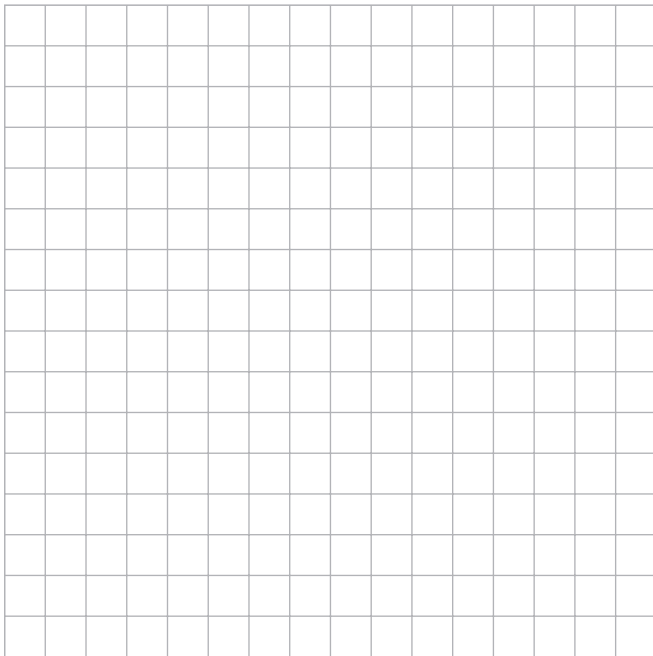
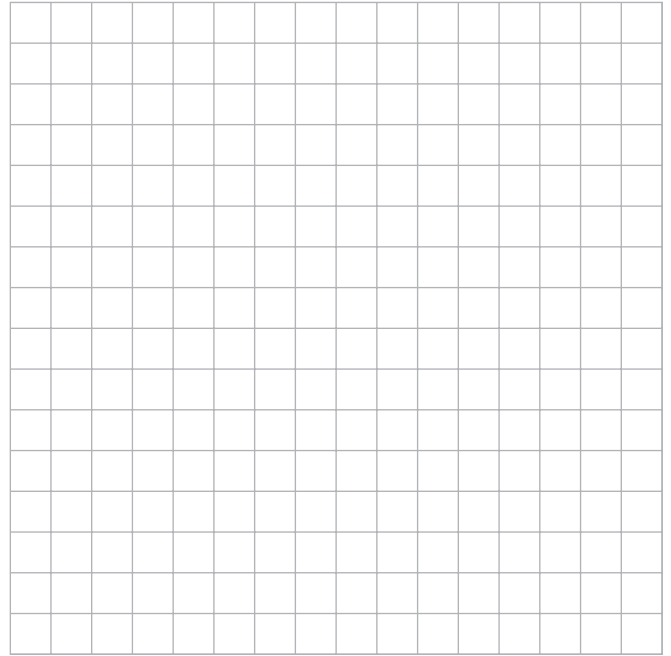
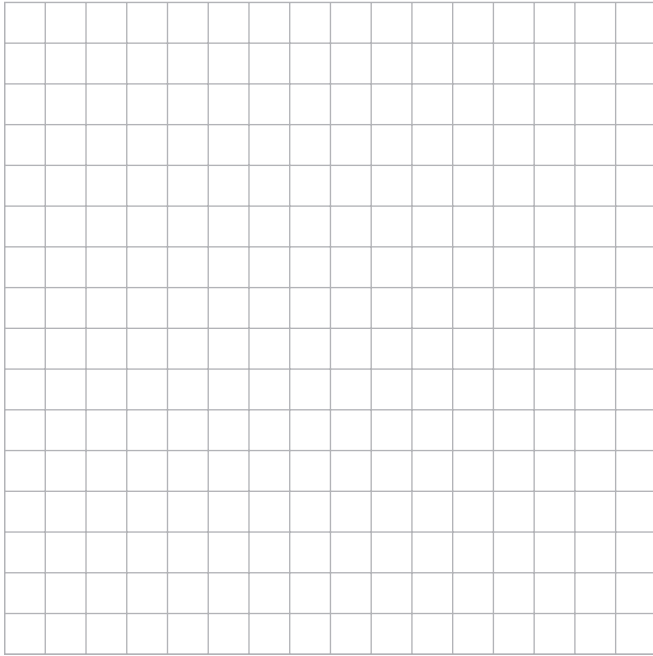
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$$F_z(z) = P[Z \leq z]$$

$z$	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9278	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

# ROUGH WORK FOR GRAPHING

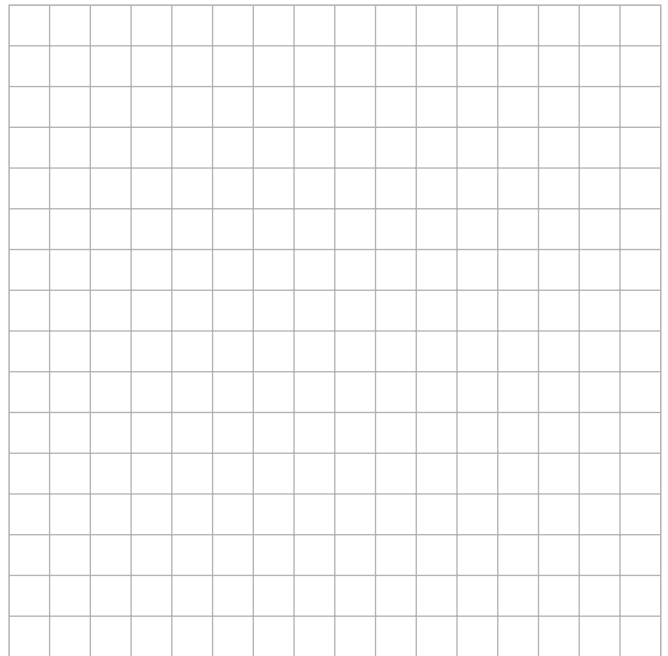
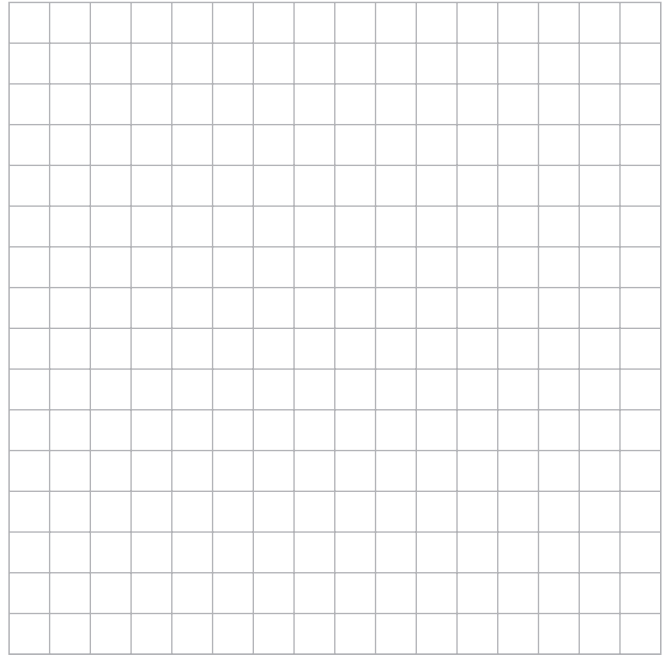
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# ROUGH WORK FOR GRAPHING

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**ROUGH WORK FOR MULTIPLE-CHOICE**

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## **ROUGH WORK FOR MULTIPLE-CHOICE**