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Principles of Mathematics 12

August 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. .

(4)

Question 7a:

8. .

(1)

Question 2:

2. .

(5)

Question 7b:

9. .

(1)

Question 3:

3. .

(5)

Question 7c:

10. .

(3)

Question 4:

4. .

(5)

Question 5a:

5. .

(2)

Question 5b:

6. .

(3)

Question 6:

7. .

(5)



PRINCIPLES OF MATHEMATICS 12

August 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 two parts: | | |
| PART A: 44 multiple-choice questions | 66 | 75 |
| PART B: 7 written-response questions | 34 | 45 |
| | Total: 100 marks | 120 minutes |
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. Determine the amplitude of $y = -5 \sin \pi(x - 3) + 4$.

- A. -5
- B. 3
- C. 4
- D. 5

2. Convert 135° to radians.

- A. 1.18
- B. 1.92
- C. 2.36
- D. 4.71

3. Determine the period of $y = \tan 4x$.

- A. $\frac{\pi}{4}$
- B. $\frac{\pi}{2}$
- C. 2π
- D. 4π

4. Determine the exact value of $\sec \frac{11\pi}{6}$.

A. -2

B. 2

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

D. $\frac{2}{\sqrt{3}}$

5. Simplify: $\frac{\csc^2 x - 1}{\csc^2 x}$

A. $\cos^2 x$

B. $\sin^2 x$

C. $-\cos^2 x$

D. $-\sin^2 x$

6. Solve: $\sqrt{2} \sin x + 1 = 0$, $0 \leq x < 2\pi$

A. $\frac{\pi}{4}, \frac{3\pi}{4}$

B. $\frac{\pi}{4}, \frac{7\pi}{4}$

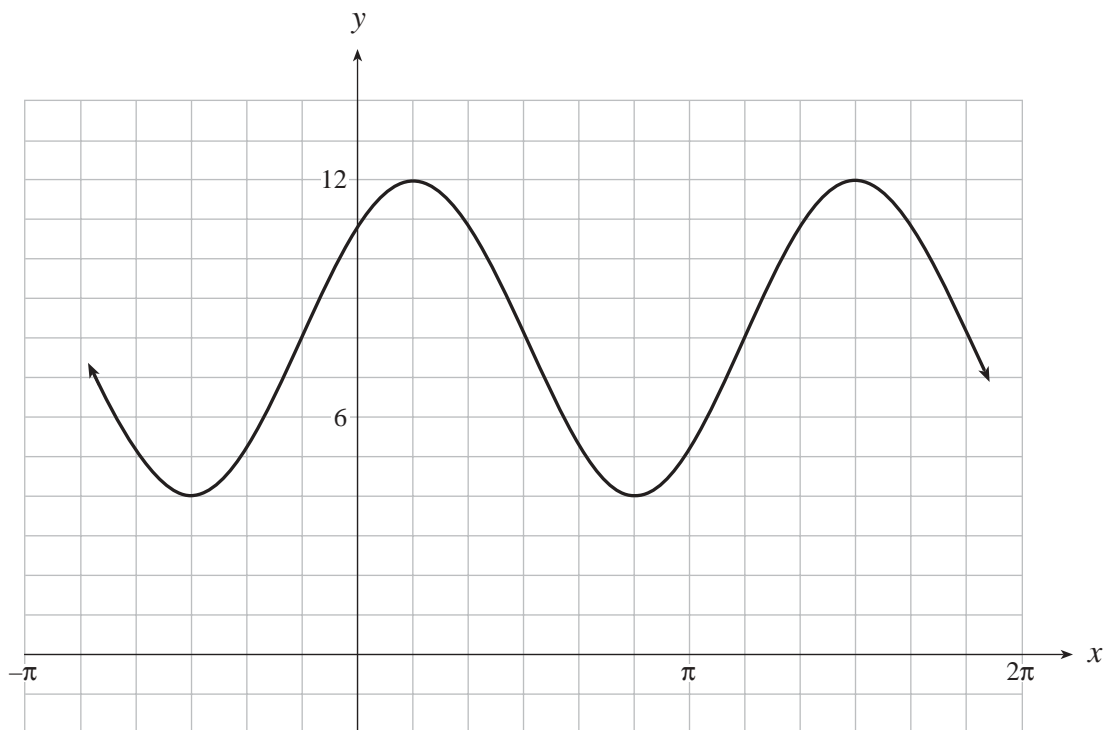
C. $\frac{3\pi}{4}, \frac{5\pi}{4}$

D. $\frac{5\pi}{4}, \frac{7\pi}{4}$

7. Solve: $3 \cos 2x = -x$, $0 \leq x < 2\pi$

- A. 0.67
- B. 0.52, 1.57
- C. 0.67, 3.07
- D. 0.95, 1.99

8. Which equation represents the sine function graphed below?



- A. $y = 4 \sin \frac{4}{3} \left(x + \frac{\pi}{6} \right) + 8$
- B. $y = 4 \sin \frac{4}{3} \left(x - \frac{\pi}{6} \right) + 8$
- C. $y = 4 \sin \frac{3}{2} \left(x - \frac{\pi}{6} \right) + 8$
- D. $y = 4 \sin \frac{3}{2} \left(x + \frac{\pi}{6} \right) + 8$

9. A wheel rolling along the ground has a radius of 32 cm and rotates once every 8 seconds. At time $t = 0$ seconds, a point P on the outside edge of the wheel is touching the ground. Determine a cosine function that gives the height, h , of point P above the ground at any time, t , where h is in cm and t is in seconds.

A. $h(t) = -32 \cos \frac{\pi}{4} t$

B. $h(t) = -32 \cos 2\pi t$

C. $h(t) = -32 \cos \frac{\pi}{4} t + 32$

D. $h(t) = -32 \cos 2\pi t + 32$

10. Determine the number of solutions for $(a \sin x + a)(b \cos x - c) = 0$ for $0 \leq x < 2\pi$, if $1 < a < b < c$.

A. 1

B. 2

C. 3

D. 4

11. Determine the common ratio of the geometric sequence: $-4, -1, -\frac{1}{4}, \dots$

A. $\frac{1}{4}$

B. $-\frac{1}{4}$

C. 4

D. -4

12. Bob worked for a company for 5 years. His starting annual salary was \$38 000. Each year his salary increased by 2% over the previous year's salary. What is the total amount of money Bob earned with this company?

A. \$156 621.10

B. \$193 800.00

C. \$197 753.53

D. \$239 708.60

13. Evaluate: $\sum_{k=3}^7 5(2)^k$

- A. 600
- B. 635
- C. 1 240
- D. 1 270

14. The 3rd term of a geometric sequence is 48 and the 6th term is $\frac{81}{4}$. Find the 1st term of the sequence.

- A. 3
- B. 27
- C. $\frac{256}{3}$
- D. 768

15. For what values of x will the following infinite geometric series have a finite sum?

$$(x+1) + (x+1)^2 + (x+1)^3 + \dots$$

- A. $-1 < x < 0$
- B. $0 < x < 1$
- C. $-2 < x < 1, x \neq -1$
- D. $-2 < x < 0, x \neq -1$

16. Change $\log_4 c = x$ to exponential form.

- A. $x^4 = c$
- B. $4^x = c$
- C. $4^c = x$
- D. $c^x = 4$

17. Determine the domain of $y = 2 \log_4(x - 1) + 5$.

- A. $x > 1$
- B. $x > 4$
- C. $x > 5$
- D. all real numbers

18. Solve: $25^{x+3} = 125^{2x-1}$

- A. $-\frac{16}{3}$
- B. 1
- C. $\frac{11}{8}$
- D. $\frac{9}{4}$

19. Solve: $\log_4(x^2 + 1) - \log_4 6 = \log_4 5$

- A. $\sqrt{10}$
- B. $\pm\sqrt{10}$
- C. $\sqrt{29}$
- D. $\pm\sqrt{29}$

20. Determine the x -intercept of $y = \log_2(x + 4) + 1$.

- A. -3
- B. -3.5
- C. -3.9
- D. -4

21. Max invests \$5 000 at an interest rate of 6% per annum, compounded monthly. Which expression represents the amount of Max's investment after t years?
- A. $5\,000(1.06)^{12t}$
 - B. $5\,000(1.005)^{12t}$
 - C. $5\,000(1.06)^t$
 - D. $5\,000(1.005)^{\frac{t}{12}}$
22. Which expression is equivalent to $\log(m^2n)^3$?
- A. $6\log m + 3\log n$
 - B. $6\log m + \log n$
 - C. $(2\log m + \log n)^3$
 - D. $\log 3m^2 + \log 3n$
23. Identify the conic: $2x^2 - 3y + 2x - 5 = 0$
- A. circle
 - B. ellipse
 - C. parabola
 - D. hyperbola
24. Determine the axis of symmetry for $x = 2(y+1)^2 - 3$.
- A. $x = -3$
 - B. $x = 3$
 - C. $y = 1$
 - D. $y = -1$

25. Change to standard form: $2x^2 + y^2 - 4x - 8 = 0$

A. $\frac{(x-1)^2}{4} + \frac{y^2}{8} = 1$

B. $\frac{(x-1)^2}{5} + \frac{y^2}{10} = 1$

C. $\frac{(x-1)^2}{6} + \frac{y^2}{12} = 1$

D. $\frac{(x-1)^2}{\frac{9}{2}} + \frac{y^2}{9} = 1$

26. Given the hyperbola $Ax^2 - By^2 = 1$, determine values for the constants A and B such that the hyperbola will have vertices on the y -axis.

A. $A < 0, B < 0$

B. $A > 0, B < 0$

C. $A < 0, B > 0$

D. $A > 0, B > 0$

27. How is the graph of $y = \sqrt{x-3} + 1$ related to the graph of $y = \sqrt{x}$?

A. $y = \sqrt{x}$ has been translated 3 units right and 1 unit up.

B. $y = \sqrt{x}$ has been translated 3 units right and 1 unit down.

C. $y = \sqrt{x}$ has been translated 3 units left and 1 unit up.

D. $y = \sqrt{x}$ has been translated 3 units left and 1 unit down.

28. Given $f(x) = 3x + 2$, determine $f^{-1}(x)$, the inverse of $f(x)$.

A. $f^{-1}(x) = \frac{x}{3} - 2$

B. $f^{-1}(x) = \frac{x-2}{3}$

C. $f^{-1}(x) = \frac{1}{3x+2}$

D. $f^{-1}(x) = 2 - \frac{x}{3}$

29. Which equation represents a reflection of the graph of $5 - x = 2y^2 + y$ in the y-axis?
- A. $5 + x = 2y^2 + y$
 - B. $5 - x = 2y^2 - y$
 - C. $5 + y = 2x^2 + x$
 - D. $-5 - x = 2y^2 + y$
30. If the point $(-3, -6)$ is on the graph of $y = f(x)$, determine a point on the graph of $y = 3|f(x)| + 1$.
- A. $(3, 3)$
 - B. $(3, 19)$
 - C. $(-3, 3)$
 - D. $(-3, 19)$
31. Which equation represents the graph of $y = f(x)$ after it is compressed horizontally by a factor of $\frac{1}{2}$ and then translated 4 units right?
- A. $y = f(2x - 8)$
 - B. $y = f(2x - 4)$
 - C. $y = f\left(\frac{x-4}{2}\right)$
 - D. $y = f\left(\frac{x}{2} - 4\right)$
32. How many different pasta meals can be made from 4 choices of pasta and 2 choices of sauces, if only one pasta and one sauce is selected for each meal?
- A. 4
 - B. 6
 - C. 8
 - D. 16

OVER

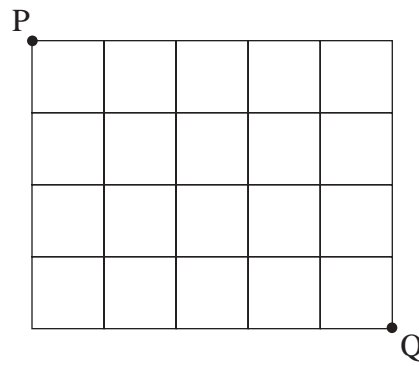
33. A man has 7 different pets and wishes to photograph them 3 at a time arranged in a line. How many different arrangements are possible?

- A. 21
- B. 35
- C. 210
- D. 840

34. Determine the 3rd term of $(2x + y)^6$.

- A. $15x^4y^2$
- B. $240x^4y^2$
- C. $120x^3y^3$
- D. $160x^3y^3$

35. Moving only to the right or down, how many different paths exist to get from point P to point Q?



- A. 120
- B. 126
- C. 180
- D. 480

36. Which expression is equivalent to ${}_n C_2$?

A. $n^2 - 2n$

B. $n^2 - n$

C. $\frac{1}{2}(n^2 - 2n)$

D. $\frac{1}{2}(n^2 - n)$

37. If 16% of all students own a Playstation, 12% a Nintendo Game Cube and 5% own both, what percentage of students owns neither?

A. 23%

B. 33%

C. 67%

D. 77%

38. In a toss of a fair coin and a roll of a fair die, what is the probability that the coin comes up heads and the die comes up an odd number?

A. $\frac{1}{12}$

B. $\frac{1}{4}$

C. $\frac{1}{2}$

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

39. In a province, 15% of grade 12 students play basketball. Two grade 12 students in the province are picked at random. Given that at least one of the students plays basketball, determine the probability that both of these students play basketball.
- A. 2.25%
 - B. 3.11%
 - C. 8.11%
 - D. 17.19%
40. The scores on a test are normally distributed with a mean score of 112 and a standard deviation of 24. Determine the percentage of scores that lie between 80 and 140 inclusive.
- A. 15%
 - B. 16%
 - C. 77%
 - D. 79%
41. The heights of a group of men are normally distributed with a mean height of 170 cm and a standard deviation of 9 cm. If the z -score for the height of one man is 1.8, what is his height (to the nearest cm)?
- A. 184
 - B. 186
 - C. 188
 - D. 190
42. Simplify: $\ln e^{x^5}$
- A. 5
 - B. $5x$
 - C. x^5
 - D. $\frac{x}{5}$

43. Suppose you play a game of cards in which only four cards are dealt from a standard deck of 52 cards. How many ways are there to obtain three of a kind? (3 cards of the same rank and 1 card of a different rank, for example 3 tens and 1 queen.)

- A. 1 872
- B. 2 496
- C. 2 548
- D. 2 704

44. If $t_n = \sum_{k=1}^n \left(\frac{1}{x}\right)^k + \sum_{k=1}^n \left(-\frac{1}{x}\right)^k$, determine t_3 .

- A. $2 + \frac{2}{x^2}$
- B. $\frac{2}{x^2}$
- C. 0
- D. $\frac{2}{x} + \frac{2}{x^2} + \frac{2}{x^3}$

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

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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.

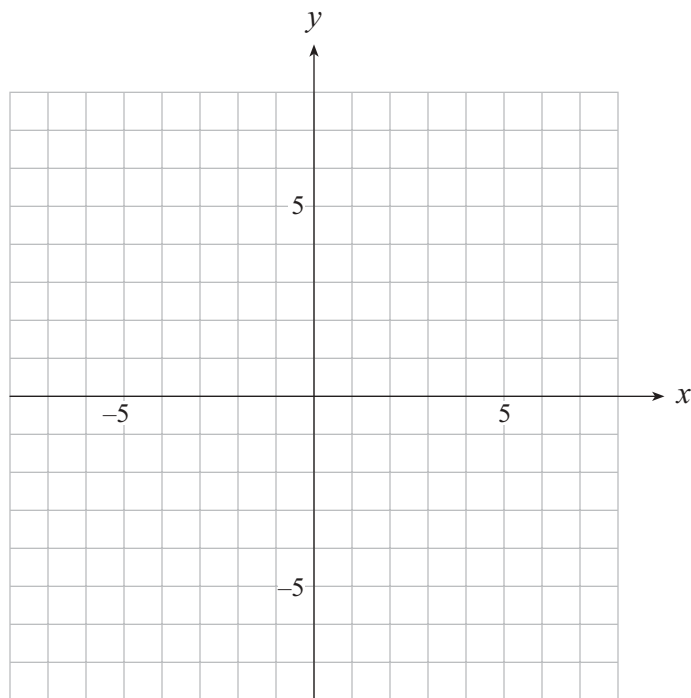
If, in a justification, you refer to information produced by the graphing calculator, this information must be presented clearly in the response. For example, if a graph is used in the solution of the problem, it is important to sketch the graph, showing its general shape and indicating the appropriate 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. An ellipse has vertices at $(-6, -4)$ and $(2, -4)$. If the length of the minor axis is 6, determine the equation of the ellipse in standard form. **(4 marks)**

A grid is provided for rough work only.



ANSWER:

2. Prove:

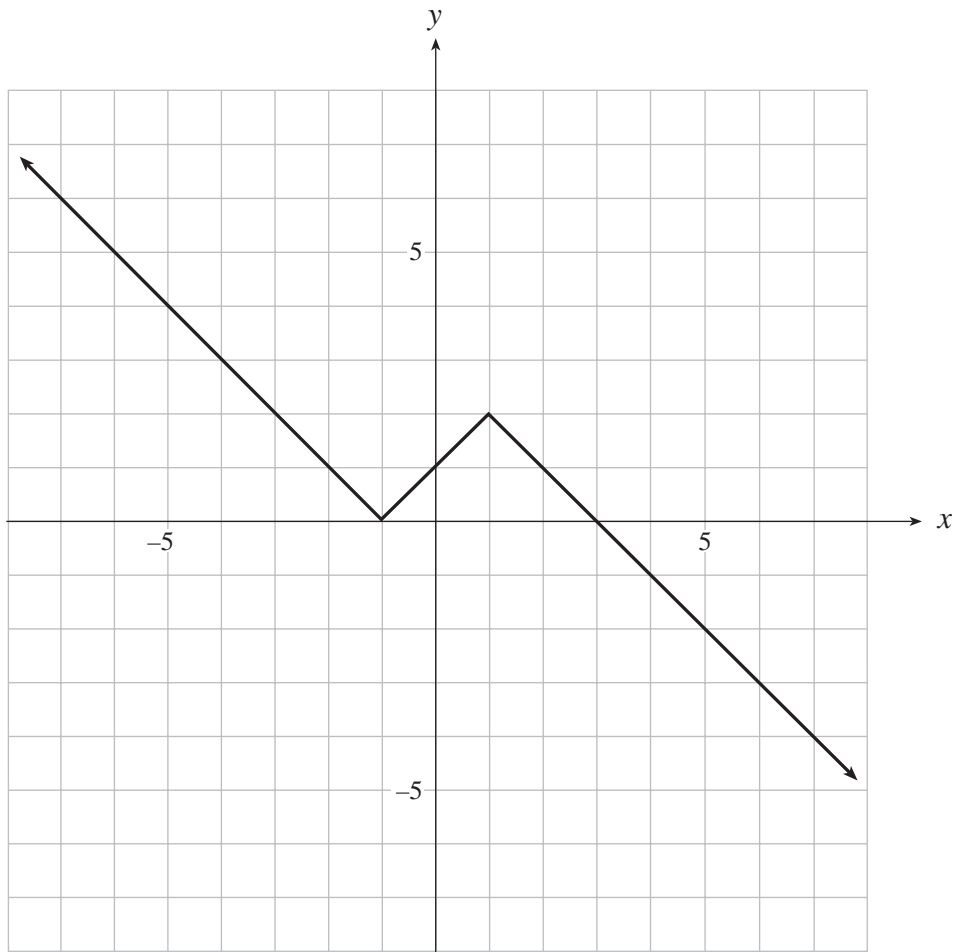
(5 marks)

$$\frac{2 \cos x + 2 \cos^2 x}{\sin 2x} = \frac{\sin x}{1 - \cos x}$$

LEFT SIDE

RIGHT SIDE

3. The graph of $y = f(x)$ is shown below. Sketch the graph of $y = \frac{1}{f(x)}$ directly on the same grid. Accurate location of key points is necessary for full marks. **(5 marks)**



4. A radioactive substance is produced from nuclear fallout. If 250 g of this substance decays to 150 g in 30 years, what is the half-life of this substance? (Solve algebraically using logarithms.) (Answer accurate to at least 2 decimal places.) **(5 marks)**

ANSWER:

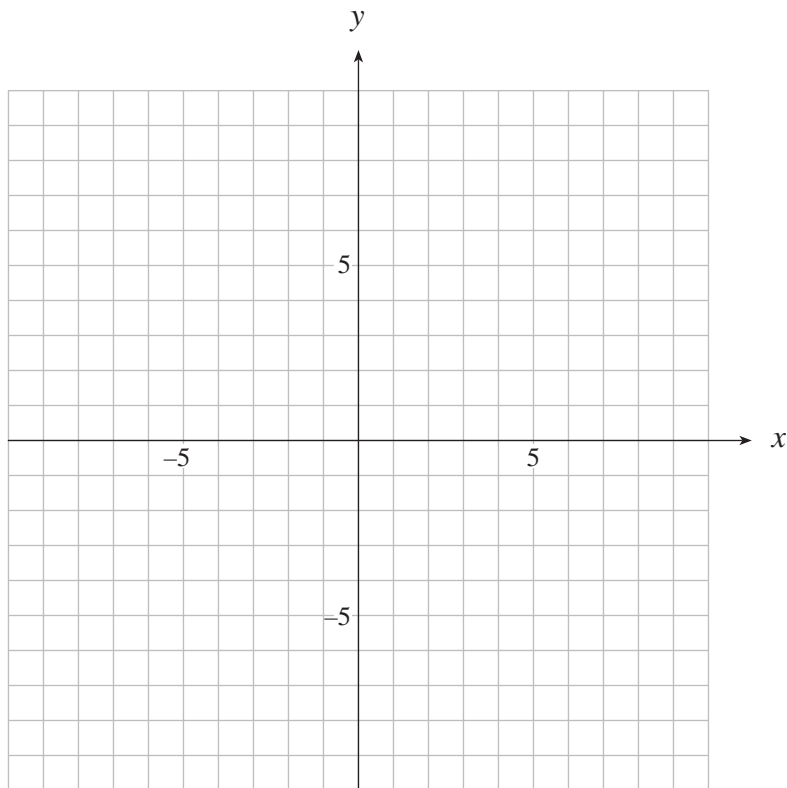
5. A relation has the equation $\log(x - y) + \log(x + y) = \log 25$.

a) Determine an equation of the relation without logarithms.

(2 marks)

ANSWER:

- b) Graph the relation $\log(x - y) + \log(x + y) = \log 25$ on the grid provided. Clearly show the asymptotes with broken lines. **(3 marks)**




6. Two basketball players, Cole and Amanda, each independently shoot a free-throw at a basket. Cole has a $\frac{2}{3}$ chance of making the free-throw and Amanda has a $\frac{3}{5}$ chance of making the free-throw. What is the probability that at least one of them will make the free-throw shot?


(5 marks)

ANSWER:


7. A fair die is rolled 720 times.

- a) What is the mean number of 's (5's) that occur in 720 rolls of a fair die? **(1 mark)**

ANSWER:

- b) What is the standard deviation of the number of 's that occur in 720 rolls of a fair die? **(1 mark)**

ANSWER:

- c) Use the normal approximation to the binomial to estimate the probability of obtaining a  between 115 and 130 times inclusive. **(3 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:

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

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

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

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

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

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

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

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

A SUMMARY OF BASIC IDENTITIES AND FORMULAE

Probability and Statistics:

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

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

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

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

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

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

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

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

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

$$\mu = np$$

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

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

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

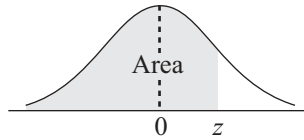
$$\text{standard error} \approx \sqrt{\frac{\hat{p}\hat{q}}{n}}$$

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



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

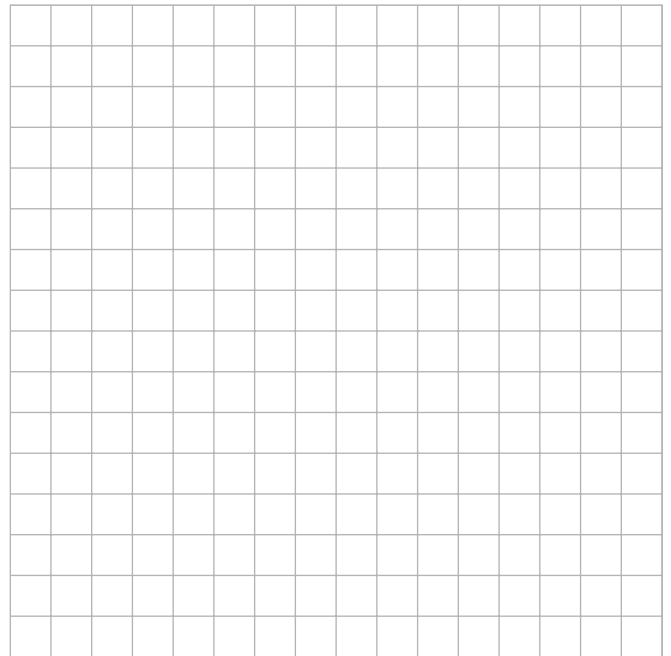
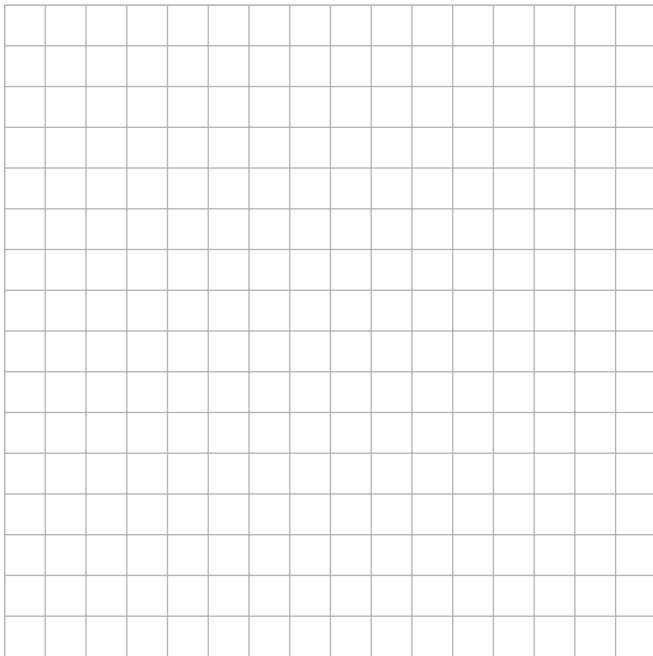
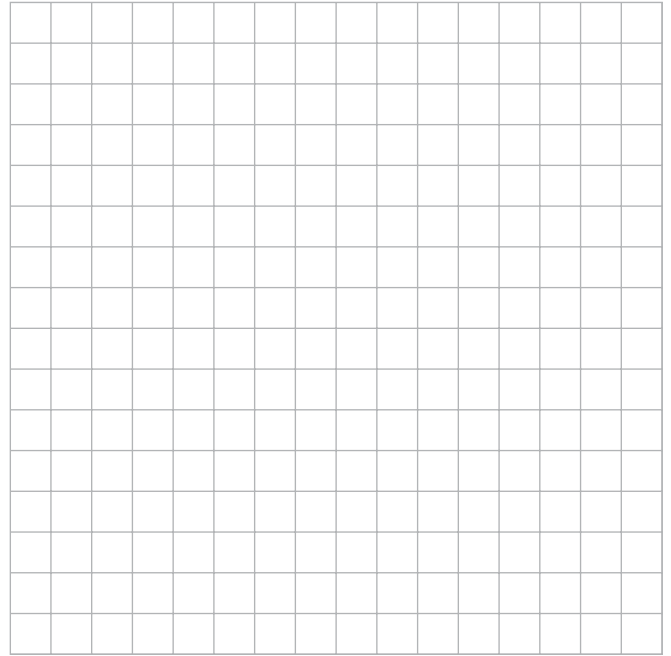
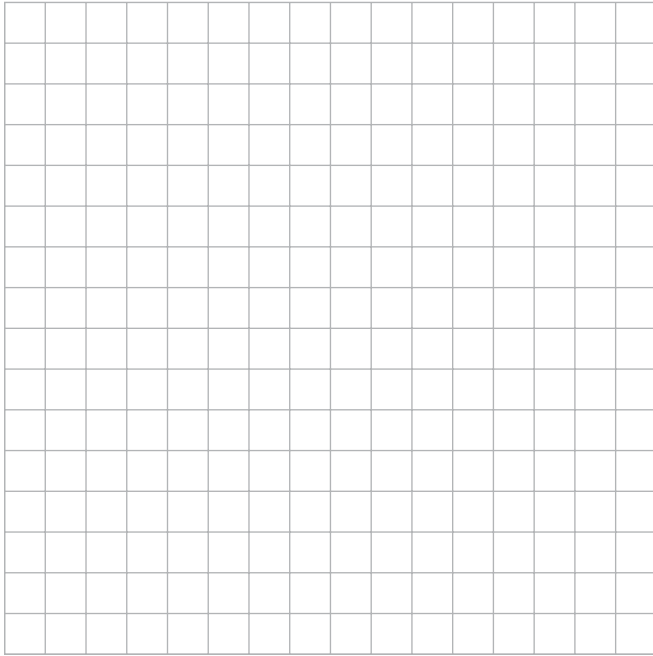
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$$F_z(z) = P[Z \leq z]$$

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

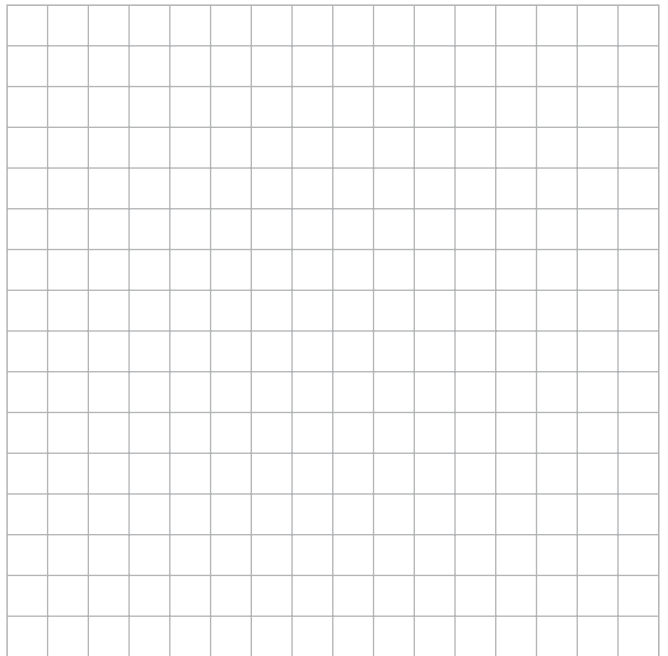
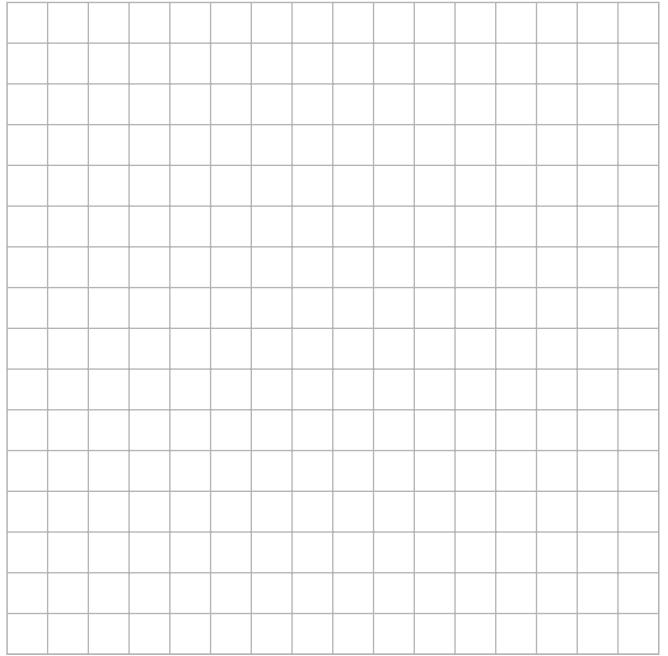
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ROUGH WORK FOR GRAPHING

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