
Grade 12
Pre-Calculus Mathematics
Standards Test

Booklet 2

January 2012

Manitoba Education Cataloguing in Publication Data

Grade 12 pre-calculus mathematics standards test.
Booklet 2. January 2012
[electronic resource]

ISBN: 978-0-7711-5043-2

1. Mathematics—Examinations, questions, etc.
 2. Mathematics—Examinations.
 3. Educational tests and measurements—Manitoba.
 4. Mathematics—Study and teaching (Secondary)—Manitoba.
 5. Calculus—Study and teaching (Secondary)—Manitoba.
 6. Mathematical ability-testing.
 7. Mathematics—Study and teaching (Secondary).
 8. Calculus—Study and teaching. (Secondary).
- I. Manitoba. Manitoba Education.
371.26097127

Manitoba Education
School Programs Division
Winnipeg, Manitoba, Canada

Permission is hereby given to reproduce this document for non-profit educational purposes provided the source is cited.

After the administration of this test, print copies of this resource will be available for purchase from the Manitoba Text Book Bureau. Order online at www.mtbb.mb.ca.

This resource will also be available on the Manitoba Education website at www.edu.gov.mb.ca/k12/assess/archives/index.html.

Websites are subject to change without notice.

Ce document est disponible en français.

Multiple-Choice Questions

Instructions

- There are 15 multiple-choice questions.
- Each question is worth 1 mark.
- Read each question carefully.
- Examine all the choices before you decide on your answer.
- You may use the spaces beside each question for rough work.
- Record your answers on the sheet provided.
- Provide only one answer per question.
- There is no penalty for guessing.
- Answer all questions.
- Calculators (scientific or graphing) are **not** allowed for this part of the test.

No marks will be awarded for work done on this page.

Multiple-Choice Questions

11. If the graph of $f(x) = |x - 1|$ is shifted 2 units down, the equation for the resulting graph is:

- a) $y = |x + 1|$
- b) $y = |x - 3|$
- c) $y = |x - 1| - 2$
- d) $y = |x - 1| + 2$

12. How many solutions are there to the equation $\cos x = \frac{1}{2}$ over the interval $[0, 3\pi]$?

- a) 1
- b) 2
- c) 3
- d) 4

13. Solve:

$$3^{x-10} = \left(\frac{1}{9}\right)^{2x}$$

- a) -10
- b) $-\frac{10}{3}$
- c) $\frac{1}{2}$
- d) 2

14. Find the y -intercept of $f(x) = -3^x - 2$.

a) $y = -5$

b) $y = -3$

c) $y = -2$

d) $y = 0$

15. Find the value of $\sec^2 \theta$ if $\tan \theta = -1$.

a) 0

b) 1

c) 2

d) undefined

16. What is the exact value of $\cos(-17\pi)$?

a) -1

b) 0

c) 1

d) undefined

17. What is the period of the function $f(x) = \tan(4x)$?

- a) 2π
- b) π
- c) $\frac{\pi}{2}$
- d) $\frac{\pi}{4}$

18. State the equation of an asymptote for the graph of $f(x) = \ln x + 2$.

- a) $y = 0$
- b) $x = 0$
- c) $y = 2$
- d) $x = -2$

19. The point $P(\theta) = \left(\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$ is on the unit circle. What are the coordinates of $P\left(\theta + \frac{\pi}{2}\right)$?

- a) $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
- b) $\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$
- c) $\left(-\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$
- d) $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$

20. How many ways can 6 people be seated at a round table?

a) ${}_6C_6$

b) ${}_6C_5$

c) $5!$

d) $6!$

21. A conic section is described by the equation $\frac{(y)^2}{9} - \frac{(x-1)^2}{16} = 1$.

What is the domain of this conic section?

a) $(-\infty, \infty)$

b) $(-\infty, -3] \cup [5, \infty)$

c) $[-3, 5]$

d) $[-2, 4]$

22. Given that $\log_a 2 = y$ and $\log_a 3 = x$, determine the value of $\log_a 18$ in terms of x and y .

a) $2xy$

b) x^2y

c) $x^2 + y$

d) $2x + y$

23. Find the sum of the infinite series:

$$8 + 4 + 2 + 1 + \dots$$

- a) 16
- b) 15
- c) 8
- d) $\frac{1}{2}$

24. What is the range of the function $y = -2\sin x + 1$?

- a) $[-2, 2]$
- b) $[-1, 3]$
- c) $[-1, 1]$
- d) $[0, 2]$

25. The 4th term in the binomial expansion of $(x - 2)^n$ is $-80x^2$.

Find the value of n .

- a) 4
- b) 5
- c) 6
- d) 7

No marks will be awarded for work done on this page.

Short-Answer Questions

Instructions

- There are 15 short-answer questions.
- Each question is worth 1 mark.
- Calculators are **not** allowed for this part of the test.
- Write your final answer in the space provided.
- Work need not be shown in order to obtain full marks for a correct answer. However, in the case of an incorrect final answer, part marks may be awarded only if work is shown.
- Solutions need not have rationalized denominators.

No marks will be awarded for work done on this page.

Short-Answer Questions

Do Not
Use

- (1 mark) 26. The probability that Jake rides his bike to school is 0.7.
The probability that Paul walks to school is 0.9.
What is the probability that Jake rides his bike to school and Paul does not walk to school?

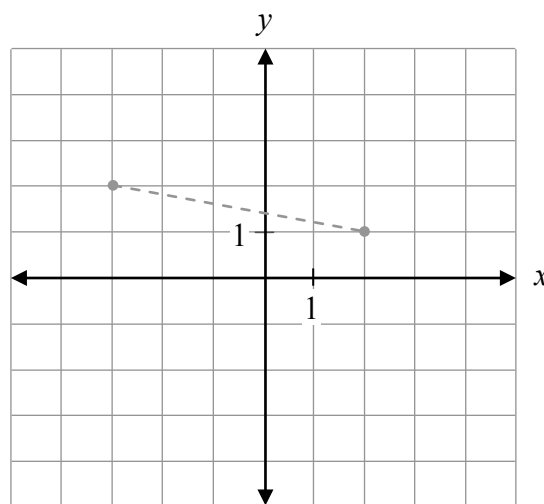
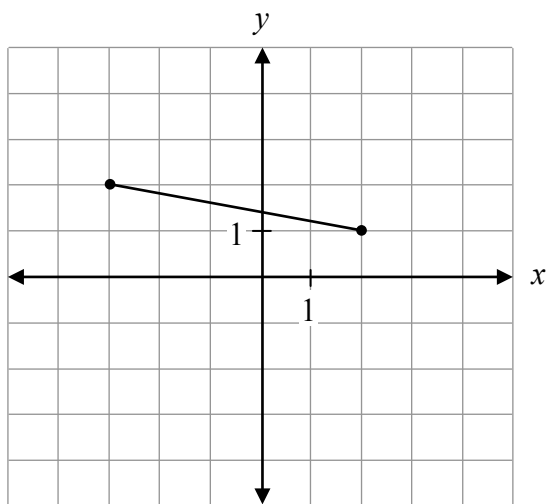
118

- (1 mark) 27. The point $P(\theta) = \left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$ is on the unit circle. What is a possible value of θ ?

119

- (1 mark) 28. The graph of $y = f(x)$ is sketched below to the left.
Sketch the graph of $y = f^{-1}(x)$ on the axes provided to the right.

120



The graph of $y = f(x)$ has already been drawn for your reference. No marks will be awarded for this graph.

(1 mark) 29. Evaluate the expression:

$$\sin 45^\circ \cos 15^\circ - \cos 45^\circ \sin 15^\circ$$

121

(1 mark) 30. Two six-sided cubes numbered 1 to 6 are tossed at the same time.

What is the probability that the sum of the numbers on the two cubes is 7?

122

(1 mark) 31. The general solution to a trigonometric equation is $\theta = \frac{\pi}{2} + 2\pi k$, $k \in \mathbb{I}$.

Give one possible equation that would have this general solution.

123

(1 mark) 32. What is the exact value of $\sec\left(\frac{5\pi}{3}\right)$?

124

(1 mark) 33. How many ways can 2 boys and 2 girls be seated in a row if they cannot sit beside someone of the same sex?

125

(1 mark) 34. Write the equation of an asymptote for $f(x) = \csc x$.

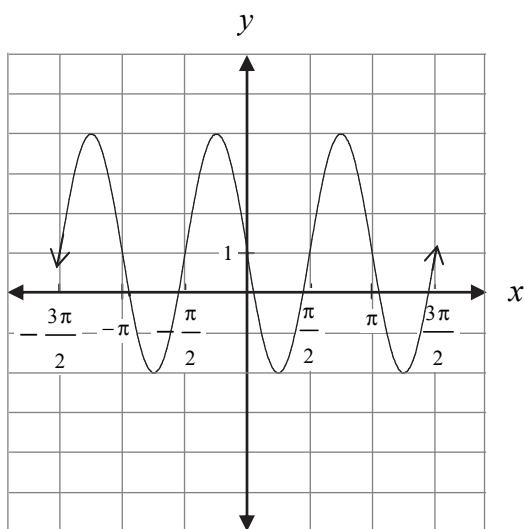
126

- (1 mark) 35. A bag contains 4 red marbles and 1 blue marble. A marble is drawn from the bag and not replaced. A second marble is drawn from the bag.
- Find the probability that both marbles drawn from the bag are red.

127

- (1 mark) 36. What is the amplitude of the following graph?

128



- (1 mark) 37. Determine the value of n .

$${}_n C_9 = {}_n C_3$$

129

(1 mark) 38. Express $\frac{\csc \theta}{\cot \theta}$ as a single trigonometric function.

Do Not
Use

130

(1 mark) 39. Solve:

$$\frac{14!}{12!} = 14n$$

131

(1 mark) 40. How many different 4-letter arrangements can be made from the letters D A D A?

132

No marks will be awarded for work done on this page.

Long-Answer Questions

Instructions

- There are 11 long-answer questions worth a total of 36 marks.
- Calculators are **not** allowed for this part of the test.
- Write each solution in the space provided.
- For full marks, your answers must show all pertinent diagrams, calculations, and explanations.
- Your solutions should be neat, clear, and well organized.
- If any curve contains asymptotes, the asymptotes should be included in the graph.
- Solutions need not have rationalized denominators.

No marks will be awarded for work done on this page.

Long-Answer Questions

Do Not
Use

(3 marks) 41. Solve the following equation:

$$\log_2(x - 2) - \log_2(x) = 3$$

133

(3 marks) 42. Prove the identity:

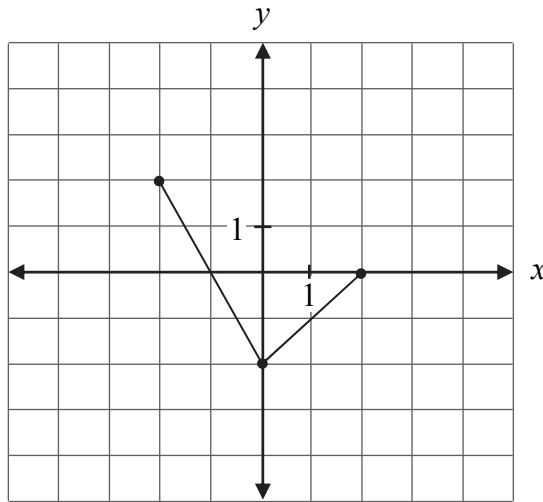
$$\sin x + \cot x \cos x = \csc x$$

Left-Hand Side

Right-Hand Side

| | | | Do Not Use |
|-----------|--------|---|---------------|
| (1 mark) | 43. a) | Using the digits 0, 1, 3, 4, 5, and 8, how many 4-digit numbers are possible if repetition of digits is not allowed? | 135 |
| (3 marks) | b) | Using the digits 0, 1, 3, 4, 5, and 8, how many 4-digit numbers greater than 4000 and divisible by 5 are possible if repetition of digits is not allowed? Briefly explain your calculations. | 136 |

44. The graph of $y = f(x)$ is sketched below.

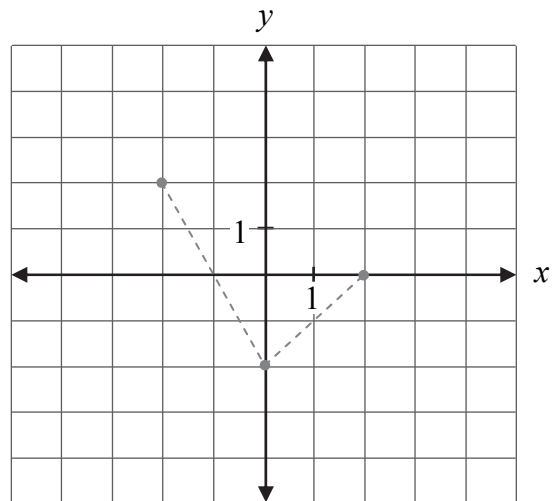
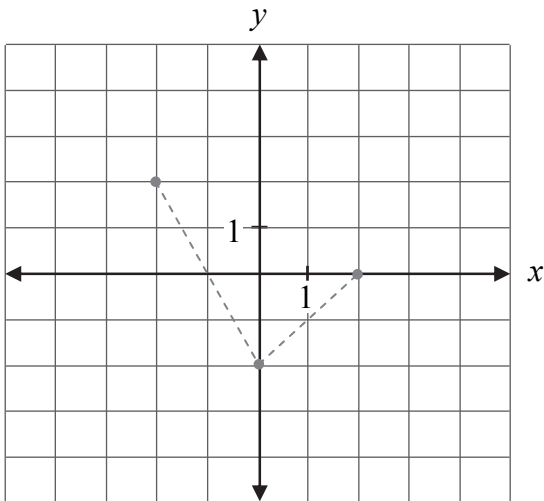


(1 mark)
(1 mark)

Sketch a clearly labelled graph of:

a) $y = f(-x)$

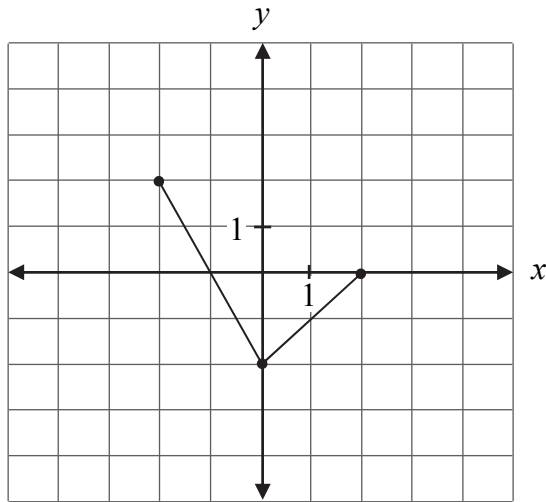
b) $y = |f(x)|$



137
138

The graph of $y = f(x)$ has already been drawn for your reference.
No marks will be awarded for this graph.

44. The graph of $y = f(x)$ is sketched below.

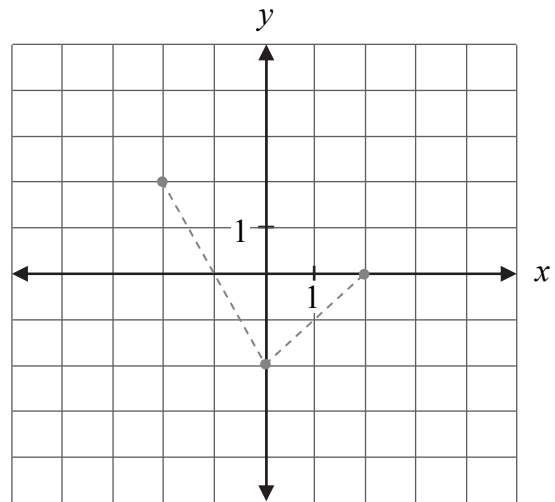
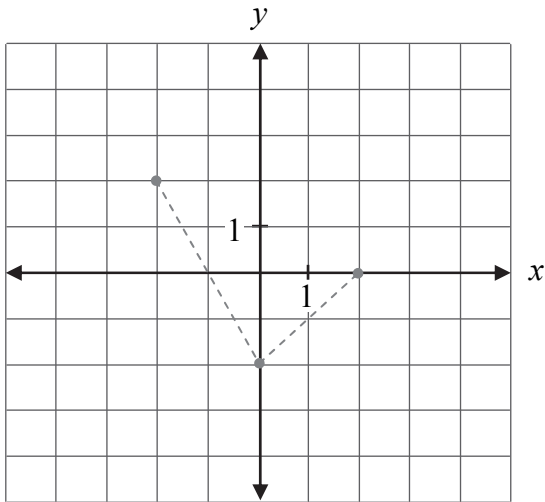


Sketch a clearly labelled graph of:

(1 mark)
(2 marks)

c) $y = f(x+1)$

d) $y = \frac{1}{f(x)}$



The graph of $y = f(x)$ has already been drawn for your reference.
No marks will be awarded for this graph.

139
140

45. Given that $\sin \alpha = \frac{\sqrt{2}}{2}$, where α is in quadrant II, and $\cos \beta = -\frac{5}{13}$, where β is in quadrant III,

(3 marks)

a) find the exact value of $\tan(\alpha - \beta)$.

141

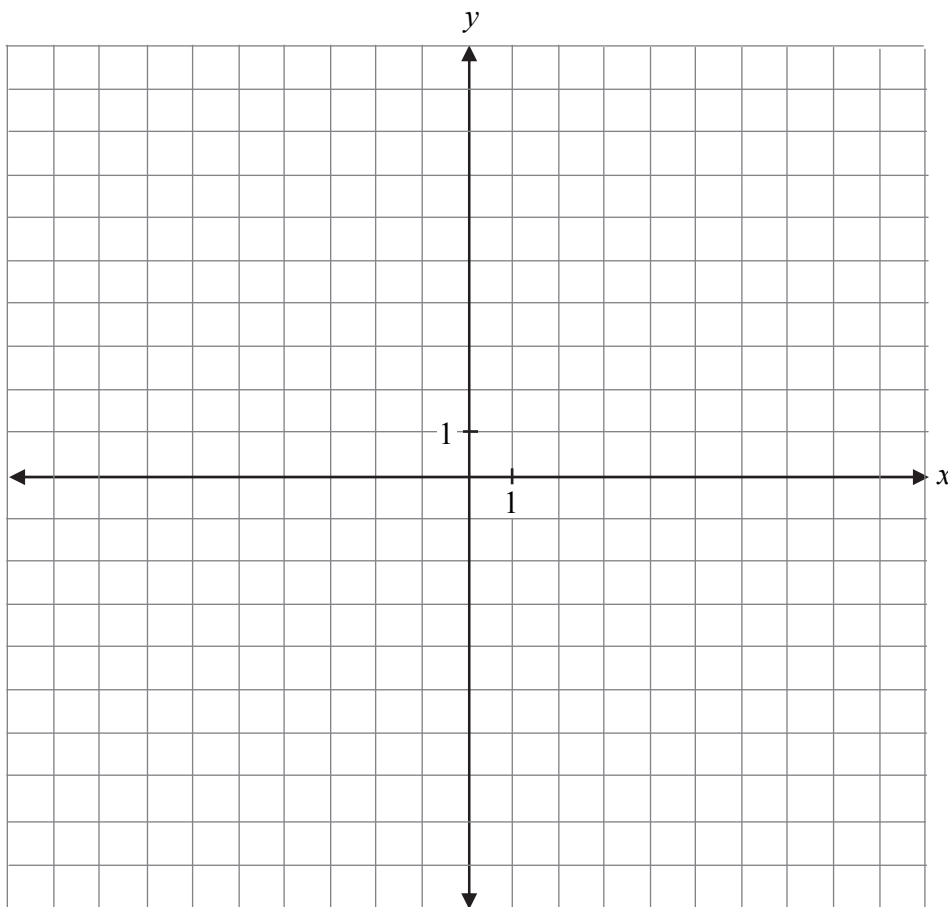
(1 mark)

b) find the exact value of $\cot(\alpha - \beta)$.

142

(2 marks) 46. a) Sketch a clearly labelled graph of the conic section described by the equation:

$$\frac{(x+3)^2}{16} + \frac{(y-2)^2}{9} = 1$$



(1 mark) b) Determine the length of the major axis for the conic section described by the equation

$$\frac{(x+3)^2}{16} + \frac{(y-2)^2}{9} = 1.$$

(2 marks) 47. Determine the coordinates of the vertex of the parabola described by the equation:

$$2y^2 - x + 4y + 3 = 0$$

(3 marks) 48. Solve the following equation over the interval $\left[\frac{\pi}{2}, \frac{3\pi}{2}\right]$.

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

(4 marks) 49. A sinusoidal curve has a maximum at (3, 6). The next maximum on the curve is at (11, 6).

The range of this function is $[-4, 6]$.

Find the values of A, B, C, and D if the sinusoidal equation for this curve is

$$y = A \sin[B(x - C)] + D.$$

$$A = \underline{\hspace{10em}}$$

$$B = \underline{\hspace{10em}}$$

$$C = \underline{\hspace{10em}}$$

$$D = \underline{\hspace{10em}}$$

(3 marks) 50. Evaluate:

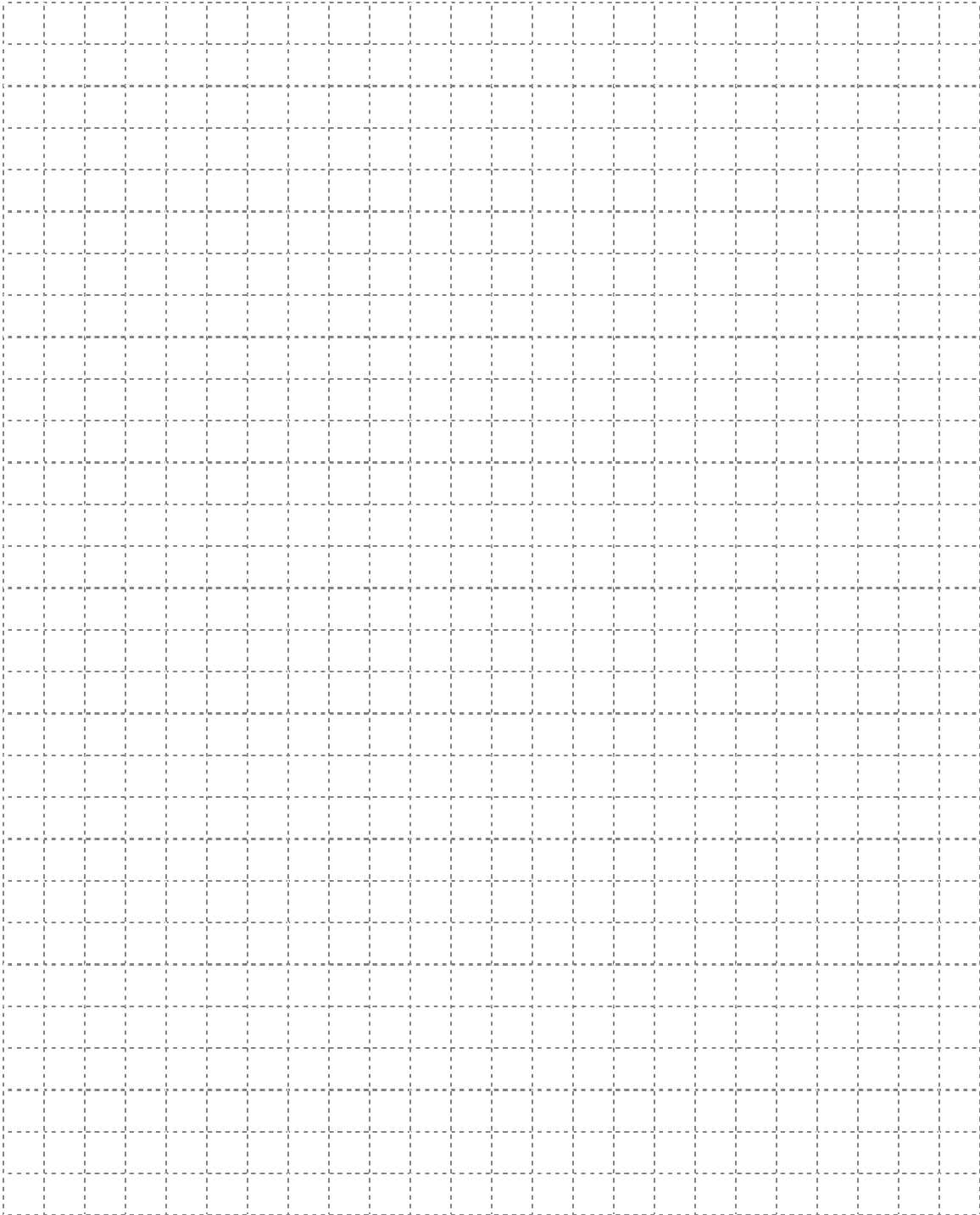
$$\sum_{n=2}^5 2(2^{n+1})$$

148

(2 marks) 51. Give a possible value of θ that will satisfy the equation below.

$$\cos \theta = \sin\left(-\frac{7\pi}{6}\right) - 1$$

No marks will be awarded for work done on this page.



No marks will be awarded for work done on this page.