Grade 12
Pre-Calculus Mathematics
Achievement Test

Booklet 2

June 2026

Manitoba

Grade 12 Pre-Calculus Mathematics Achievement Test:
Booklet 2 (June 2026)

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

Websites are subject to change without notice.

Disponible en français.

While the department is committed to making its publications as accessible as possible, some parts of this document are not fully accessible at this time.

Available in alternate formats upon request.

Grade 12 Pre-Calculus Mathematics Achievement Test

DESCRIPTION

Time Required to Complete the Test: 3 hours
Additional Time Allowed: 30 minutes

Number and Marks by Question Type

	Selected Response	Constructed Response	Marks
Booklet 1	—	15	35
Booklet 2	**9**	**20**	**56**
Total	9	35	**91**

Note that diagrams and graphs provided in the test booklets may not be drawn to scale.

DIRECTIONS

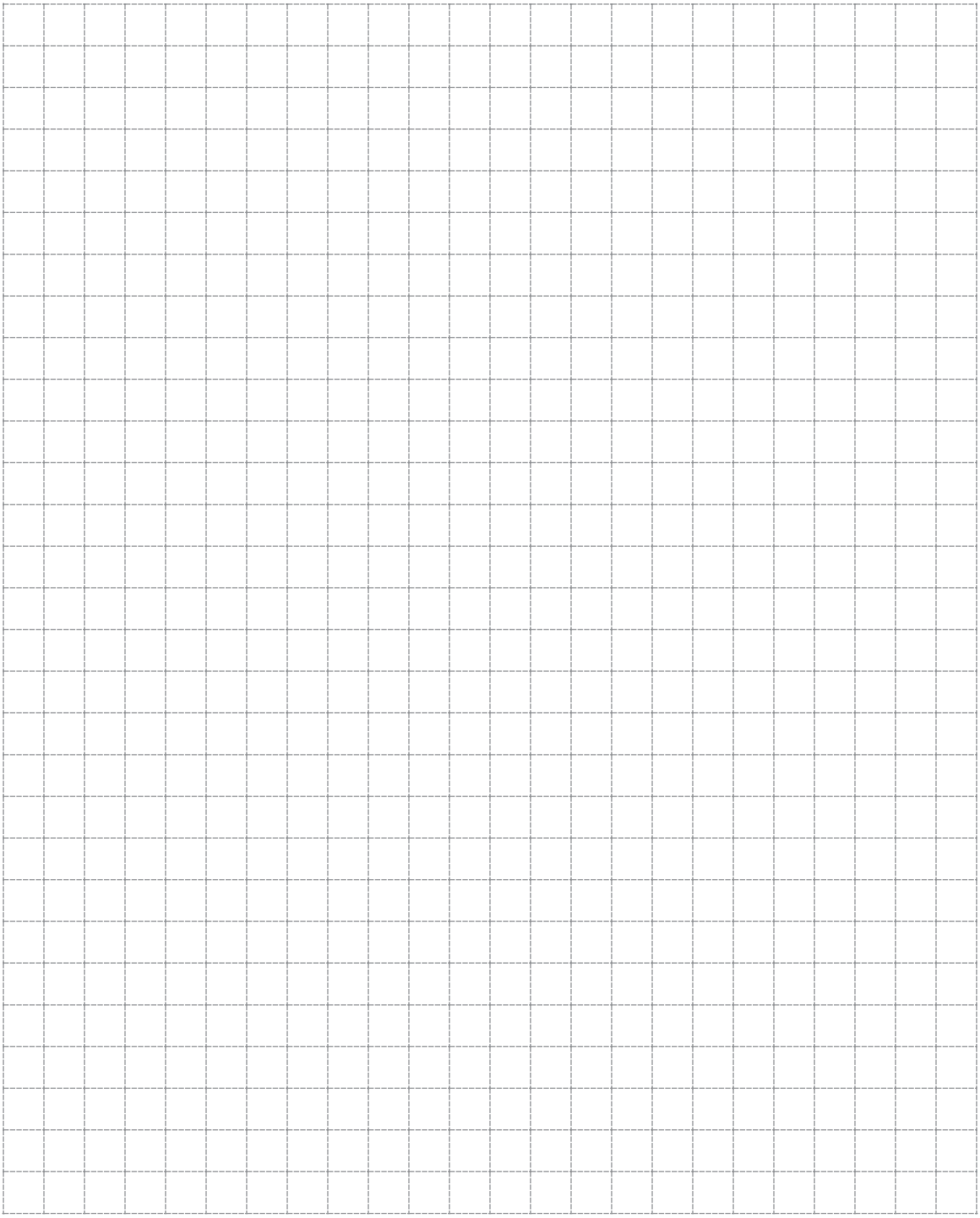
Selected Response Questions

- Calculators are **not** allowed for this part of the test.
- You may use the spaces beside each question for rough work.
- Provide only one answer per question.
- There is no penalty for guessing.
- Record your answers on the sheet provided.

Constructed Response Questions

- Calculators are **not** allowed for this part of the test.
- Write each solution in the space provided.
- For full marks, your answer must show all pertinent diagrams, calculations, and explanations.
- Your solutions should be neat, clear, and well organized.

NO MARKS WILL BE AWARDED FOR WORK DONE ON THIS PAGE.



Question 16 — 1 mark

Identify the expression that is equivalent to $\tan\theta\left(\csc^2\theta - 1\right)$.

a. $\cot\theta$

b. $\tan\theta$

c. $\sec\theta$

d. $\sin\theta$

Question 17 — 1 mark

Identify the expression that represents the number of ways five books can be arranged on a shelf if two of them must be together.

a. $5!2!$

b. $5! - 2!$

c. $4!2!$

d. $3!2!$

Question 18 — 1 mark

Identify the value of x in the equation, $\log_8 x = -\frac{1}{3}$.

a. -2

b. $-\frac{1}{2}$

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

d. 2

Question 19 — 1 mark

Given the functions, $f(x)=\frac{1}{x}$ and $g(x)=\sqrt{x-1}$, identify the domain of $f(g(x))$.

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

b. $(-\infty,1)\cup(1,\infty)$

c. $[1,\infty)$

d. $(1,\infty)$

Question 20 — 1 mark

Given $f(x)=\frac{3(x+2)}{5(x+2)(x-2)}$, identify the equation of the horizontal asymptote.

a. $y=-2$

b. $y=0$

c. $y=\frac{3}{5}$

d. $y=2$

Question 21 — 1 mark

Identify the range of the sinusoidal function, $f(x)=2\sin x+3$.

a. $\{y \mid y\in\mathbb{R}\}$

b. $\{y \mid 2\le y\le 4, y\in\mathbb{R}\}$

c. $\{y \mid -2\le y\le 2, y\in\mathbb{R}\}$

d. $\{y \mid 1\le y\le 5, y\in\mathbb{R}\}$

Question 22 — 1 mark

Given that $(x-3)$ is a factor of the polynomial $P(x)$, identify which of the following is true.

a. $P(3)=0$

b. $P(0)=3$

c. $P(0)=-3$

d. $P(-3)=0$

Question 23 — 1 mark

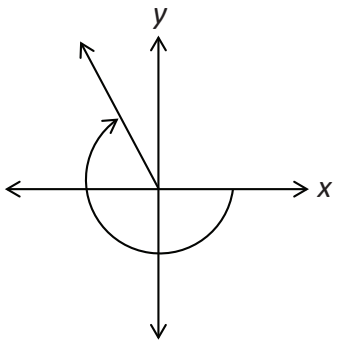
Identify the value that best represents the angle in standard position.

a. −4.4 radians

b. −2 radians

c. 1.3 radians

d. 1.9 radians



Question 24 — 1 mark

Identify the expression that is equivalent to $\log_a(x+2)+3\log_a(x)$.

a. $\log_a(3(x+2))$

b. $\log_a\left(x^3(x+2)\right)$

c. $\log_a\left(\frac{(x+2)}{x^3}\right)$

d. $\log_a x+\log_a 2+\log_a x^3$

Question 25 — 3 marks — 117

Evaluate.

$$\tan^3\left(\frac{3\pi}{4}\right)+\csc\left(\frac{-4\pi}{3}\right)\cos\left(\frac{13\pi}{6}\right)$$

Question 26 — 2 marks

118

If $a = \log 4$ and $b = \log 3$, express $\log 36$ in terms of a and b.

Question 27 — 2 marks — 119

Justify that $\tan 2x$ has a non-permissible value at $x = \frac{\pi}{4}$.

Question 28 — 2 marks — 120

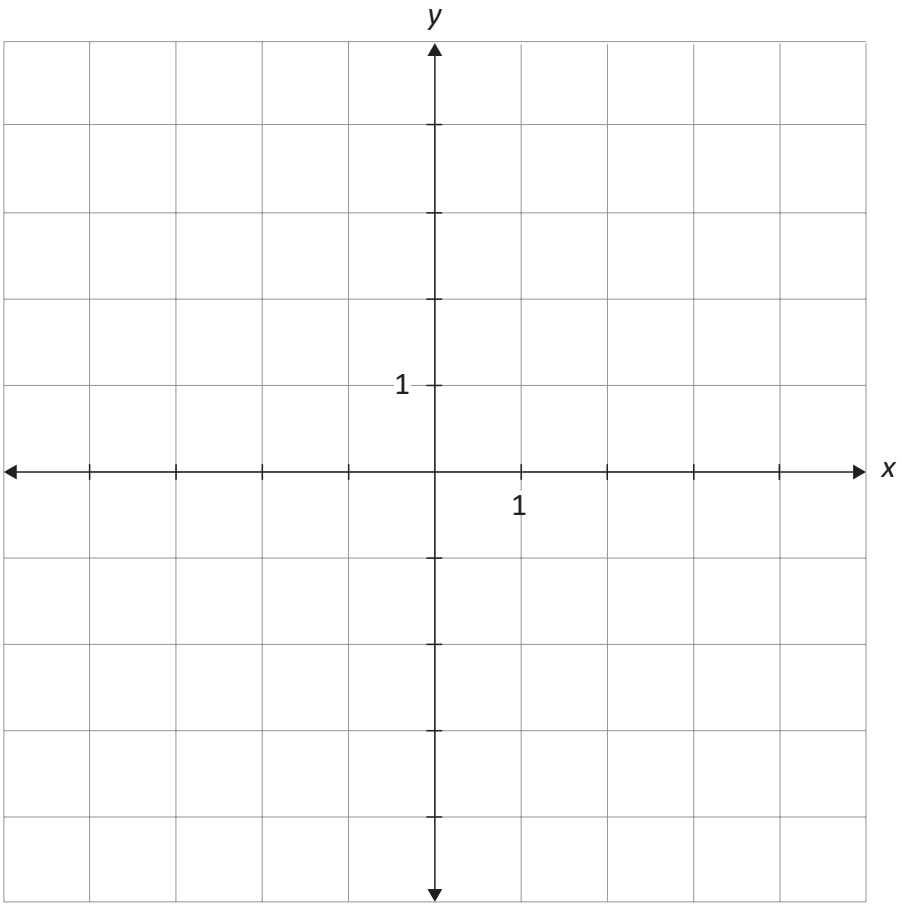
Determine the exact value of $\tan\theta$, if $\sec\theta = \frac{6}{5}$ and θ terminates in quadrant IV.

Question 29 — a) 2 marks b) 1 mark

121
122

Given the function, $g(x)=\dfrac{4}{x^2+1}$,

a) sketch the graph of $g(x)$.



b) state the range of the graph of $g(x)$.

Question 30 — a) 2 marks b) 1 mark

123
124

Given $y = x^2 - 4$,

a) determine the equation of the inverse.

$y =$ _____

b) state a restriction on the domain of $y = x^2 - 4$, in order for its inverse to be a function.

Question 31 — 3 marks

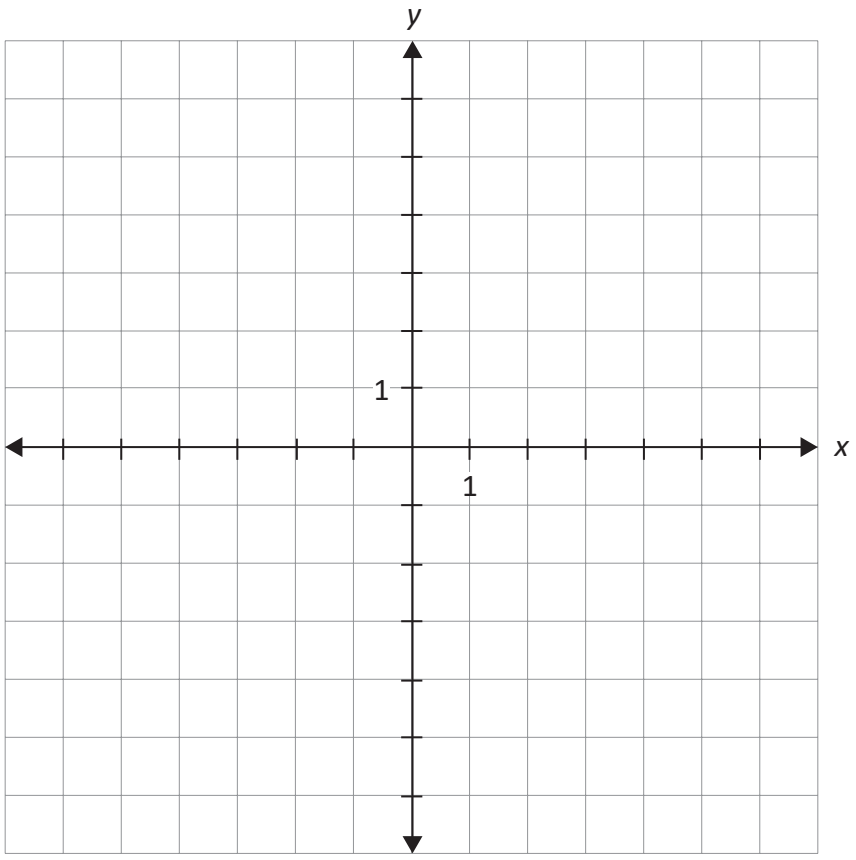
125

Given $\cos\alpha = -\frac{1}{3}$ and $\sin\beta = -\frac{2}{3}$ where α and β terminate in the same quadrant, determine the exact value of $\sin(\alpha - \beta)$.

Question 32 — 4 marks

126

Sketch the graph of $y + 2 = -\sqrt{4x}$.



Question 33 — 3 marks

127

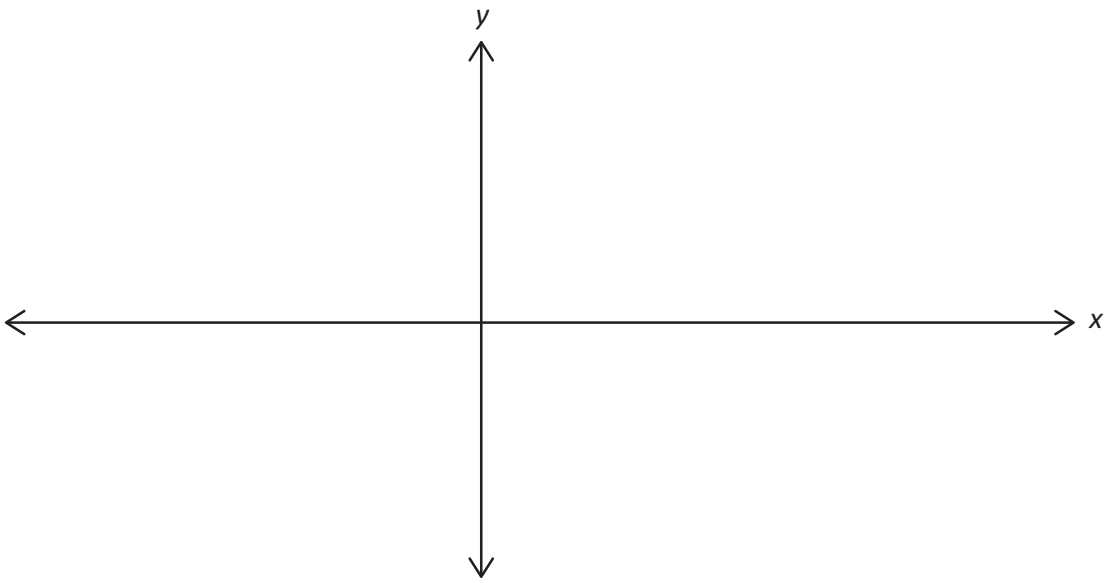
Express $p(x) = x^4 - x^3 - 6x^2 + 4x + 8$ in completely factored form, given that $(x+1)$ is a factor of $p(x)$.

$p(x) =$ _____

Question 34 — 4 marks

128

Sketch at least one period of the graph of $y = -\sin\left(2\left(x - \frac{\pi}{4}\right)\right)$.



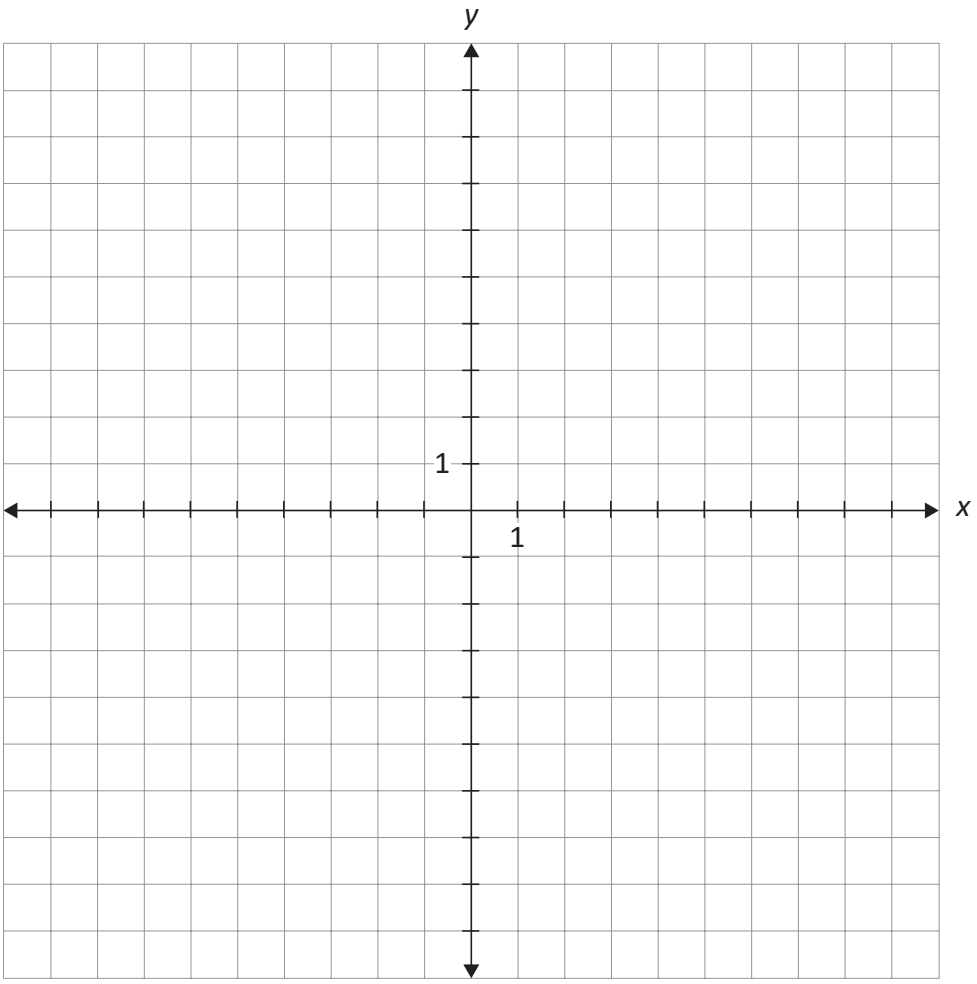
Question 35 — a) 1 mark b) 2 marks

129
130

Given $g(x) = \log_2(x) - 3$,

a) determine the *x*-intercept of the graph.

b) sketch the graph of $g(x)$.



Question 36 — 1 mark

131

Modesola incorrectly evaluated the expression, $\cos^2\left(30^\circ\right) - \sin^2\left(30^\circ\right)$.

Modesola's answer:

$\cos^2(30^\circ) - \sin^2(30^\circ)$

$= 2\cos(30^\circ)$

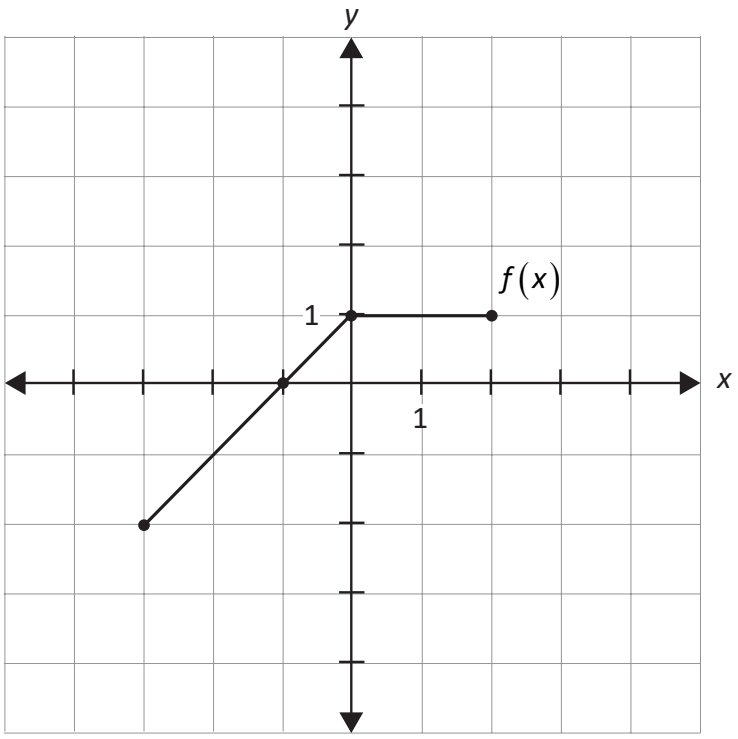
$= 2\left(\frac{\sqrt{3}}{2}\right)$

$= \sqrt{3}$

Describe their error.

Question 37 — 1 mark — 132

Given the graph of $y = f(x)$, state the range of $y = \sqrt{f(x)}$.



Question 38 — 1 mark

133

Determine a value of x that satisfies $\sin^2(2x-1)+\cos^2(x+5)=1$.

Question 39 — 2 marks

134

Solve, algebraically.

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

Question 40 — 2 marks

135

Determine the total number of arrangements of the letters in the word GUIDES if the vowels and consonants must alternate.

Question 41 — 2 marks — 136

Solve, algebraically.

$$\frac{5!(n-5)!}{3!(n-6)!} = 80$$

Question 42 — 1 mark

137

Justify that 2.1 is a better estimate than 2.6 for the value of $\log_5 29$.

Question 43 — 2 marks — 138

When $p(x) = x^3 + kx + 6$ is divided by $(x + 2)$, the remainder is 4. Determine the value of k.

Question 44 — 3 marks

139

Describe the transformations used to obtain the graph of the function $y = -f\left(7x + 14\right)$ from the graph of $y = f\left(x\right)$.