



# education

Department of  
Education  
FREE STATE PROVINCE

**GRADE 12**

**MATHEMATICS**

**GRADE 12**

**INFORMAL TEST 5**

**16 FEBRUARY 2024**

stanmorephysics.com

**MARKS: 50**

**DURATION: 60 MINUTES**



This question paper consists of 4 pages.

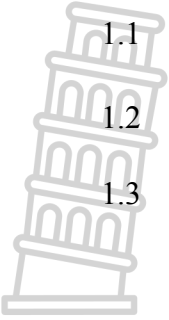
## INSTRUCTIONS AND INFORMATION

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Read the following instructions carefully before answering the questions.

1. This question paper consists of **5** questions.
2. Answer ALL the questions.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Clearly show ALL calculations, diagrams, graphs, etc. which you have used in determining your answers.
5. Answers only will NOT necessarily be awarded full marks.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless otherwise stated.
7. If necessary, round off answers to TWO decimal places, unless stated otherwise

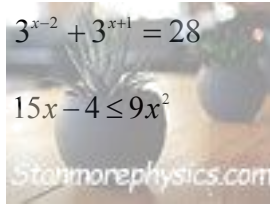


**QUESTION 1**1. Solve for  $x$ :

1.1  $x(x-1) = 30$  (3)

1.2  $3^{x-2} + 3^{x+1} = 28$  (4)

1.3  $15x - 4 \leq 9x^2$  (4)

**[11]****QUESTION 2**Given the geometric series:  $8x^2 + 4x^3 + 2x^2 + \dots$ 2.1 Determine the  $n^{\text{th}}$  term of the series. (1)2.2 For what value(s) of  $x$  will the series converge? (3)2.3 Calculate the sum of the series to infinity if  $x = \frac{3}{2}$ . (3)**[7]****QUESTION 3**Given:  $h(x) = 4^x$  and  $f(x) = 2(x-1)^2 - 8$ 3.1 Sketch the graphs of  $h$  and  $f$  on the diagram sheet provided. Indicate ALL Intercepts with the axes and any turning point. (8)3.2 Write down the inverse of  $h(x)$  in the form  $g(x) =$  (2)3.3 Sketch the graph of  $g(x)$  on the same system of axes. (2)3.4 The graph of  $f$  is shifted 2 units to the LEFT. Write down the equation of the new graph. (2)3.5 Show, algebraically that  $h\left(x + \frac{1}{2}\right) = 2h(x)$ . (3)**[17]**

Given:  $f(x) = \frac{-6}{x-3} - 1$

- 4.1 Determine the coordinates of the y-intercept of  $f$ . (1)
- 4.2 Calculate the coordinates of the x-intercept of  $f$ . (2)
- 4.3 Write down the equations of the asymptotes of  $f$ . (2)
- 4.4 Sketch the graph of  $f$  on the DIAGRAM SHEET PROVIDED clearly indicating. ALL asymptotes and intercepts with the axes. (3)

[8]

**QUESTION 5**

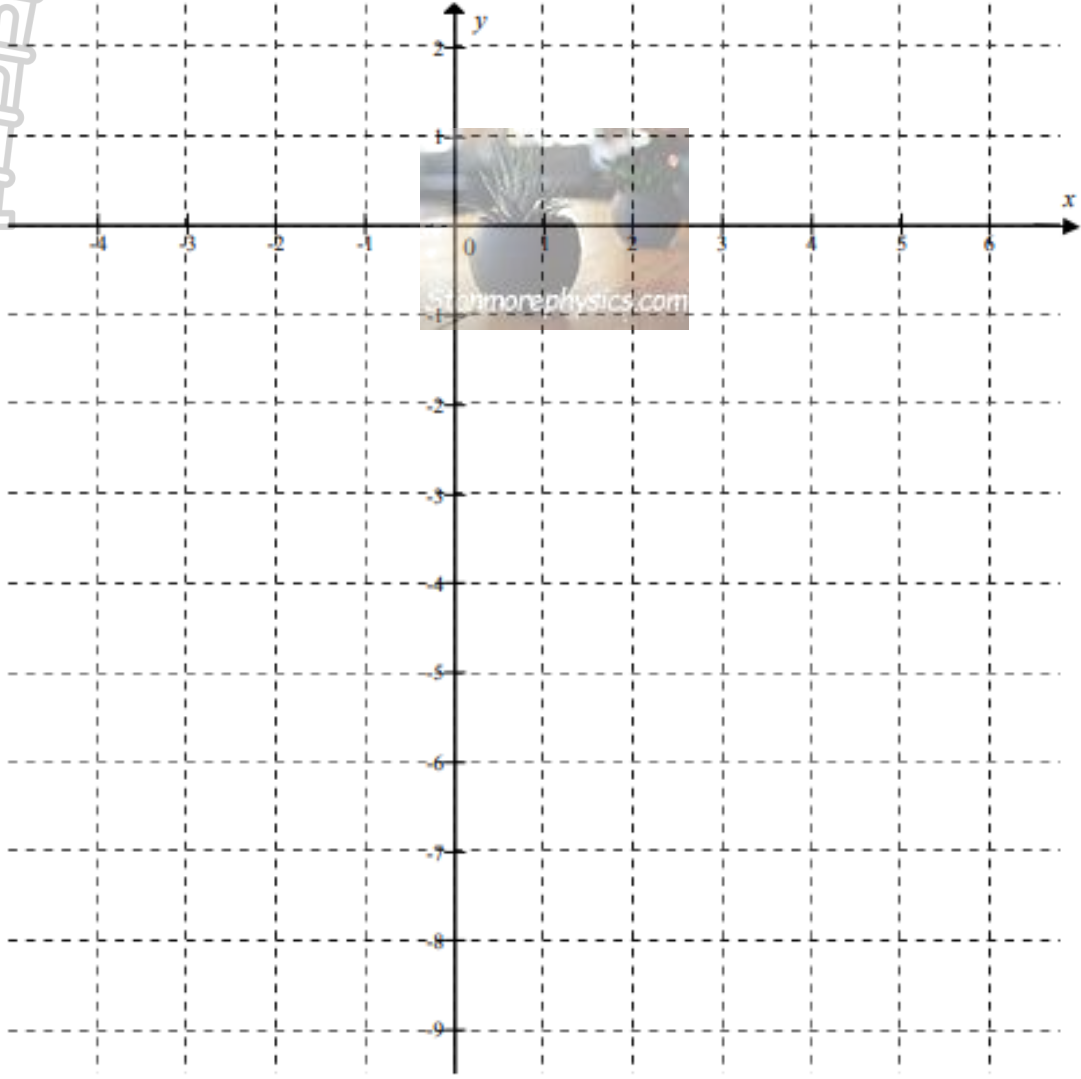
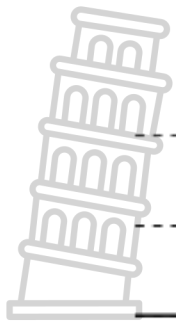
5. Determine the general solution of :

$6 \sin^2 \theta + \cos \theta = 4$  (7)

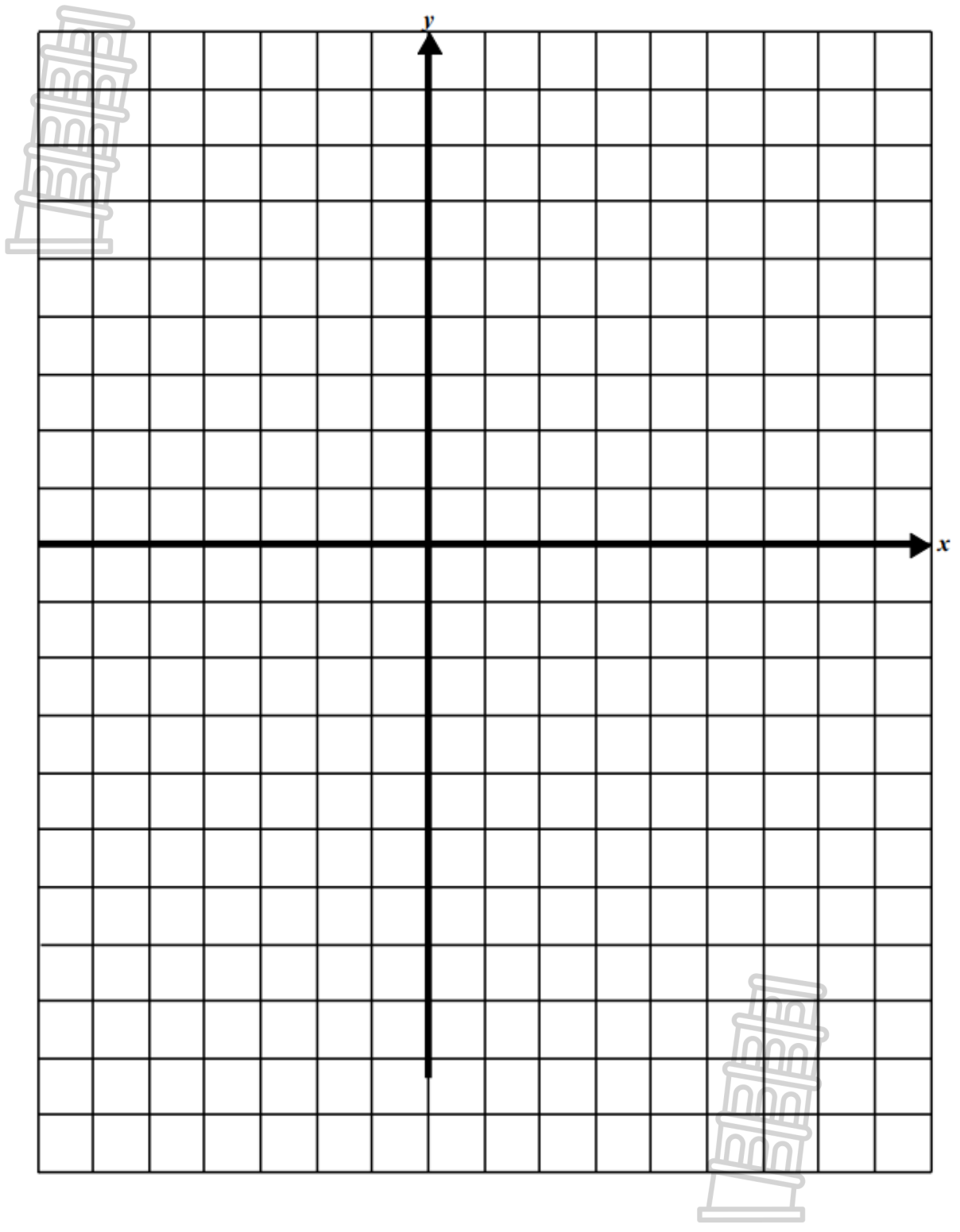
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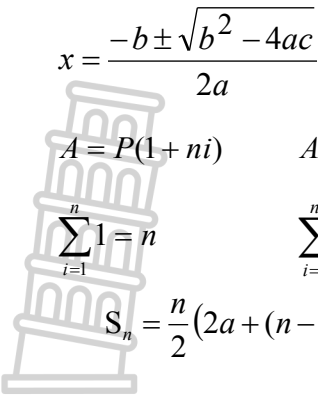


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$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

$$A = P(1 - i)^n$$

$$A = P(1 + i)^n$$

$$\sum_{i=1}^n 1 = n$$

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

$$T_n = a + (n-1)d$$

$$S_n = \frac{n}{2}(2a + (n-1)d)$$

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

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

$$S_\infty = \frac{a}{1 - r}; \quad -1 < r < 1$$

$$F = \frac{x[(1+i)^n - 1]}{i}$$

$$P = \frac{x[1 - (1+i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

$$(x - a)^2 + (y - b)^2 = r^2$$

$$\text{In } \triangle ABC: \quad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\text{area } \triangle ABC = \frac{1}{2} ab \sin C$$

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

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

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

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

$$\cos 2\alpha = \begin{cases} \cos^2 \alpha - \sin^2 \alpha \\ 1 - 2 \sin^2 \alpha \\ 2 \cos^2 \alpha - 1 \end{cases}$$

$$\sin 2\alpha = 2 \sin \alpha \cos \alpha$$

$$\bar{x} = \frac{\sum fx}{n}$$

$$\sigma^2 = \frac{\sum (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)}$$

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

$$\hat{y} = a + bx$$

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$



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**NATIONAL SENIOR CERTIFICATE**

**GRADE 12**

**MATHEMATICS**

**TERM 1**

**2024 INFORMAL TEST 5**

**MARKING GUIDELINE**

This marking guideline consists of 6 pages



QUESTION 1

1.1	$x(x-1) = 30$ $x^2 - x - 20 = 0$ $(x+4)(x-5) = 0$ $x = -4$ or $x = 5$	✓ standard form ✓ factors ✓ answers (3)
1.2	$3^{x-2} + 3^{x+1} = 28$ $3^x \cdot 3^{-2} + 3^x \cdot 3 = 28$ $3^x \left( \frac{1}{9} + 3 \right) = 28$ $3^x = 28 \div \frac{28}{9}$ $3^x = 9$ $3^x = 3^2$ $x = 2$	✓ common factor ✓ simplification ✓ same base ✓ answer (4)
1.3	$15x - 4 \leq 9x^2$ $-9x^2 + 16x - 4 \leq 0$ $9x^2 - 16x + 4 \geq 0$ $(9x+2)(x-2) \geq 0$ CV: $-\frac{2}{9}$ and $2$ $x \leq -\frac{2}{9}$ or $x \geq 2$	✓ standard form ✓ factors ✓ ✓ answer (4)
<b>[11]</b>		

QUESTION 2

2.1	$8x^2 + 4x^3 + 2x^4 + \dots$ $r = \frac{4x^3}{8x^2} = \frac{x}{2}$ $T_n = 8x^2 \left( \frac{x}{2} \right)^{n-1}$	✓ answer (1)
2.2	For a series to converge $-1 < r < 1$ $-1 < \frac{x}{2} < 1$ $-2 < x < 2$	✓ $-1 < x < 1$ ✓ substitution ✓ answer (3)

2.3

8x<sup>2</sup> + 4x<sup>3</sup> + 2x<sup>4</sup> + .....  
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$$8\left(\frac{3}{2}\right)^2 + 4\left(\frac{3}{2}\right)^3 + 2\left(\frac{3}{2}\right)^4 + \dots$$

$$18 + \frac{27}{2} + \frac{81}{8} + \dots$$

$$S_{\infty} = \frac{18}{1 - \left(\frac{3}{4}\right)}$$

$$S_{\infty} = 72$$

✓ a and r

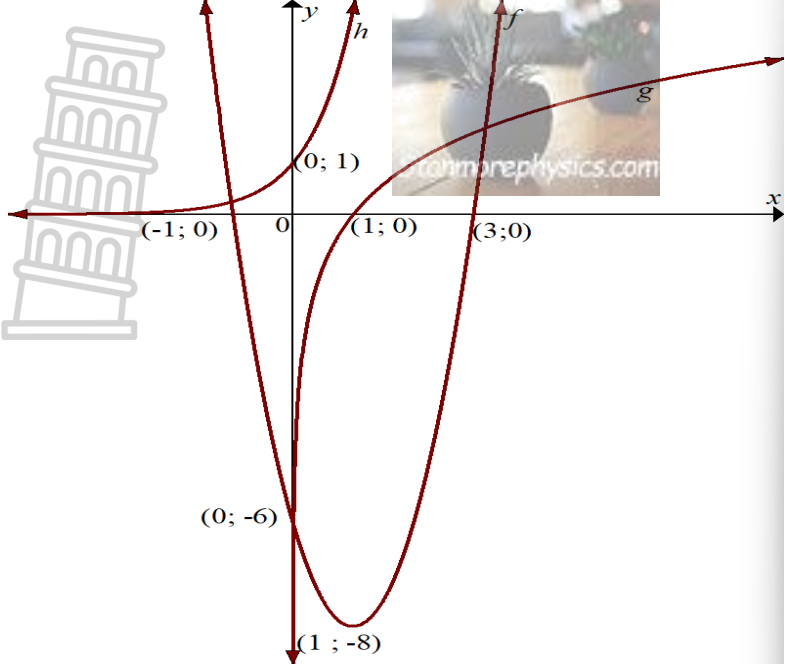
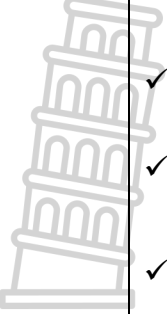
✓ substitution

✓ answer

(3)

[7]



3.1		<ul style="list-style-type: none"> <li>✓ swop <math>x</math> and <math>y</math></li> <li>✓ answer</li> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> <li>(8)</li> </ul>
3.2	$y = 4^x$ $x = 4^y$ $y = \log_2 x$ $g(x) = \log_2 x$	<ul style="list-style-type: none"> <li>✓ swop <math>x</math> and <math>y</math></li> <li>✓ answer (2)</li> </ul>
3.3	$f(x) = 2(x-1)^2 - 8$ $f(x) = 2(x-1+2)^2 - 8$ $f(x) = 2(x+1)^2 - 8$	<ul style="list-style-type: none"> <li>✓ ✓ answer (2)</li> </ul>
3.4	$h\left(x + \frac{1}{2}\right) = 4^{x+\frac{1}{2}}$ $h\left(x + \frac{1}{2}\right) = 4^x \cdot 4^{\frac{1}{2}}$ $h\left(x + \frac{1}{2}\right) = 2(4^x)$ $h\left(x + \frac{1}{2}\right) = 2h(x)$	 <ul style="list-style-type: none"> <li>✓ substitution</li> <li>✓ <math>h\left(x + \frac{1}{2}\right) = 4^x \cdot 4^{\frac{1}{2}}</math></li> <li>✓ simplification (3)</li> </ul>
		[17]

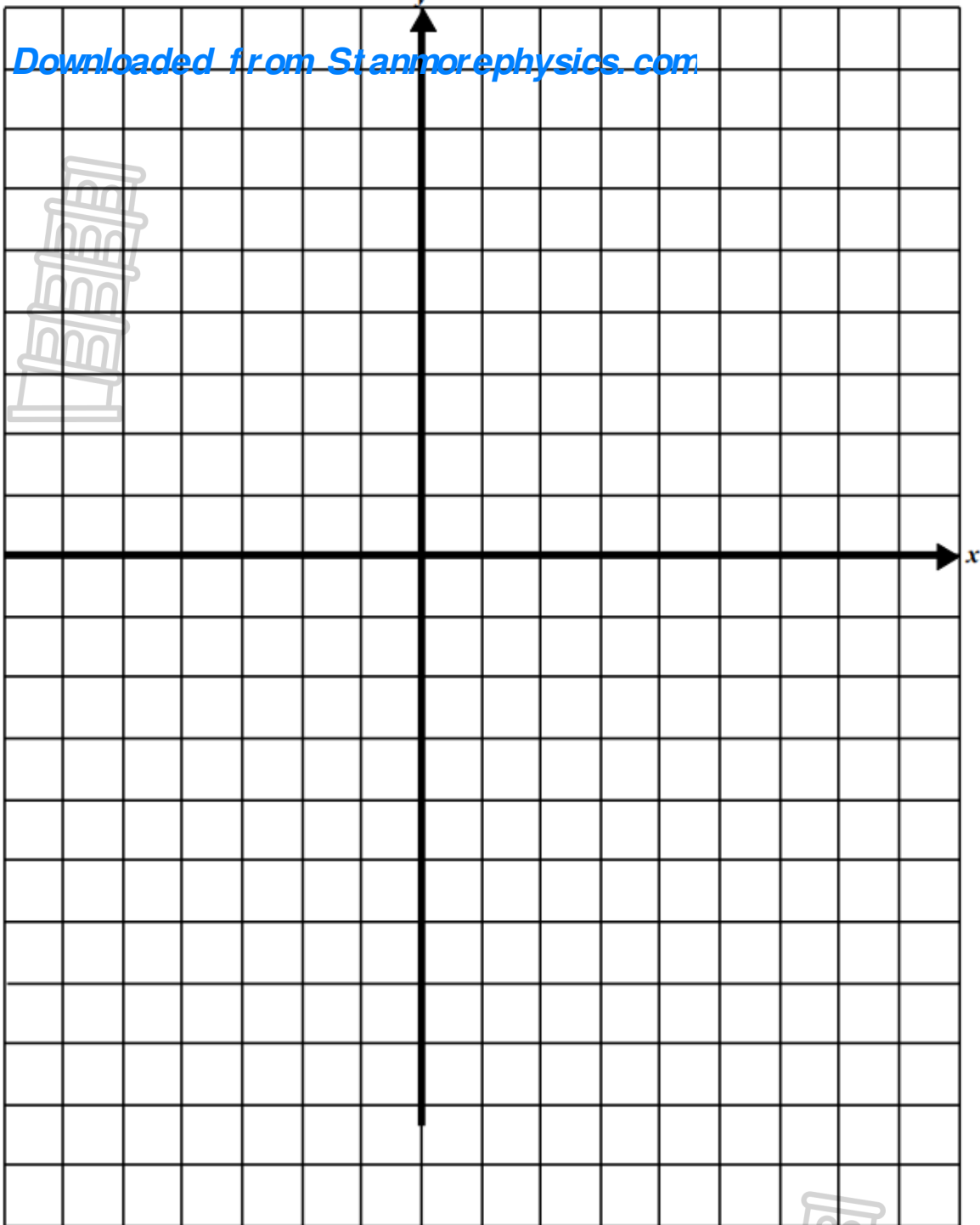
QUESTION 4

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4.1	$f(x) = \frac{-6}{x-3} - 1$ <p>For y-intercept let <math>x = 0</math></p> $y = \frac{-6}{0-3} - 1 = 1$	✓ (1)
4.2	$y = \frac{-6}{x-3} - 1$ <p>For x-intercept let <math>y = 0</math></p> $0 = \frac{-6}{x-3} - 1$ $1 = \frac{-6}{x-3}$ $x-3 = -6$ $x = -3$	✓ $y = 0$ ✓ answer (2)
4.3	$x = 3$ $y = -1$	✓ $x = 3$ ✓ $y = -1$ (2)



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[8]

<p>5</p> $6\sin^2 \theta + \cos \theta = 4$ $6(1 - \cos^2 \theta) + \cos \theta = 4$ $6 - 6\cos^2 \theta + \cos \theta - 4 = 0$ $-6\cos^2 \theta + \cos \theta + 2 = 0$ $6\cos^2 \theta - \cos \theta - 2 = 0$ $(3\cos \theta - 2)(2\cos \theta + 1) = 0$ $\cos \theta = \frac{2}{3} \quad \text{or/of} \quad \cos \theta = -\frac{1}{2}$ $\theta = 48,19^\circ + 360^\circ \cdot k \quad \text{or/of} \quad \theta = 311,81^\circ + 360^\circ \cdot k$ <p style="text-align: center;">OR/OF</p> $\theta = 120^\circ + 360^\circ \cdot k \quad \text{or/of} \quad \theta = 240^\circ + 360^\circ \cdot k$ <p>where/waar <math>k \in Z</math></p>	<ul style="list-style-type: none"> <li>✓ for/vir <math>1 - \cos^2 \theta</math></li> <li>✓ for the two general solutions/ <i>vir die twee algemene oplossings</i></li> <li>✓ for standard form/ <i>vir standaardvorm</i></li>   <li>✓ for factors / <i>vir faktore</i></li>   <li>✓ for the other two general solutions/ <i>vir die ander twee algemene oplossings</i></li>   <li>✓ for answers of <math>\cos \theta = \frac{2}{3}</math>  <i>vir antwoorde van <math>\cos \theta = \frac{2}{3}</math></i></li>   <li>✓ for answers of <math>\cos \theta = -\frac{1}{2}</math>  <i>vir antwoorde van <math>\cos \theta = -\frac{1}{2}</math></i></li> </ul> <p style="text-align: right;">(7)</p>
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