HORNSBY GIRLS HIGH SCHOOL

Mathematics Advanced

Year 11 Assessment 2 Term 2 2020

STUDENT NUMBER: _____

General Instructions

- Reading Time – 5 minutes
- Working Time – 65 minutes
- Write using black pen
- Calculators approved by NESA may be used
- In Questions 6 – 10, show relevant mathematical reasoning and/or calculations
- Marks may be deducted for untidy and poorly arranged work
- Do not use correction fluid or tape
- Do not remove this paper from the examination
- Students are permitted to refer to one double-sided A4 page of handwritten topic summaries which they prepared prior this assessment

Total marks – 55

Section I Pages 2 – 4

5 marks

Attempt Questions 1 – 5

Allow about 8 minutes for this section

Answer on the Objective Response Answer Sheet provided

Section II Pages 5 – 15

50 marks

Attempt Questions 6 -10

Allow about 57 minutes for this section

Write your answers in the space provided.

Question	***1-5***	***6***	***7***	***8***	***9***	***10***	***Total***
Total	*/5*	*/10*	*/10*	*/9*	*/10*	*/11*	*/55*

This assessment task constitutes 30% of the Preliminary Higher School Certificate Course School Assessment

Section I

5 marks
Attempt Questions 1 – 5
Allow about 8 minutes for this section

Use the Objective Response answer sheet for Questions 1 – 5

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1 The circle $x^2 + 4x + y^2 + 2y = 4$ has:

(A) Centre $(2,1)$, radius 3 units

(B) Centre $(2,1)$, radius 9 units

(C) Centre $(-2,-1)$, radius 3 units

(D) Centre $(-2,-1)$, radius 9 units

2 Which expression is NOT equivalent to $2b^{-1\frac{1}{2}}$?

(A) $\dfrac{2}{b\sqrt{b}}$

(B) $2b^{-\frac{3}{2}}$

(C) $\dfrac{2}{b^2\sqrt{b}}$

(D) $\dfrac{2\sqrt{b}}{b^2}$

3 Which of the following is an odd function?

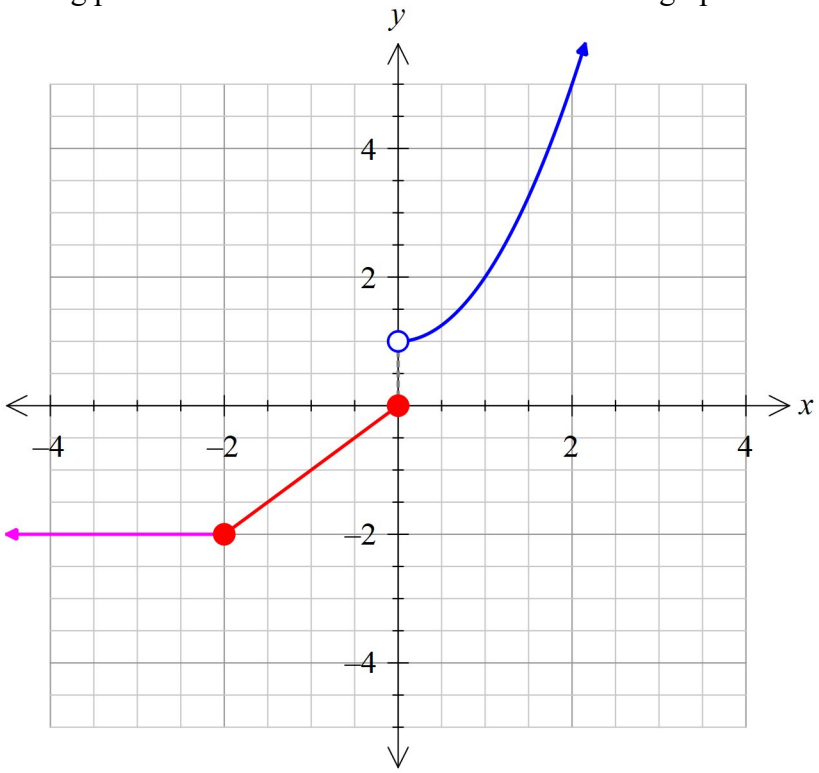
(A) $y = x^3 + x$

(B) $y = |x+1|$

(C) $y^2 = 9 - x^2$

(D) $y = x^2 + x^4$

4 Which of the following piece-wise function definitions matches the graph below?



(A) $$f(x)=\begin{cases} x^2+1, & x\geq 0 \\ x, & -2<x<0 \\ -2, & x\leq -2 \end{cases}$$

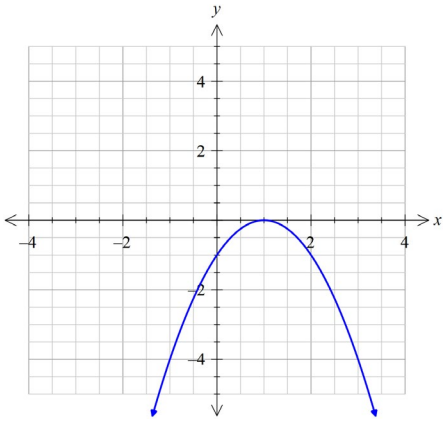
(B) $$f(x)=\begin{cases} x^2+1, & x>0 \\ x, & -2<x\leq 0 \\ -2, & x\leq -2 \end{cases}$$

(C) $$f(x)=\begin{cases} x^2+1, & x\geq 0 \\ 2x, & -2<x<0 \\ -2, & x\leq -2 \end{cases}$$

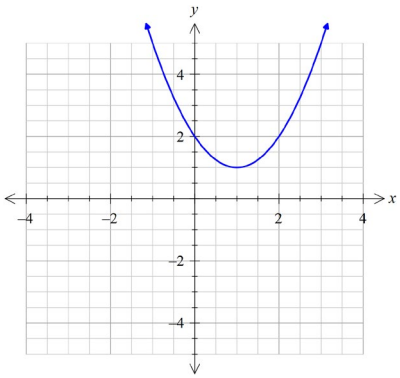
(D) $$f(x)=\begin{cases} x^2+1, & x>0 \\ 2x, & -2<x\leq 0 \\ -2, & x\leq -2 \end{cases}$$

5 Which graph below represents a quadratic function in the form $y = ax^2 + bx + c$, where $\Delta > 0$ and $a < 0$?

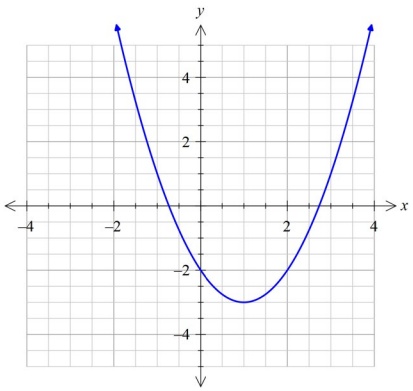
(A)



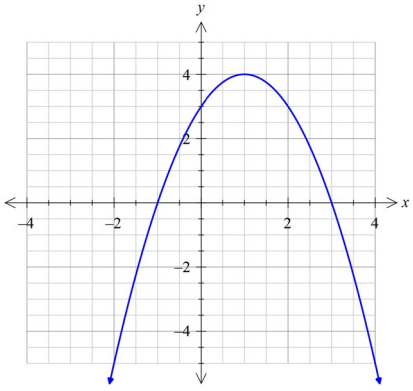
(B)



(C)



(D)



End of Section I

Section II
50 marks
Attempt Questions 6-10

Question 6 (10 marks)

(a) Rationalise the denominator of $\frac{1}{\sqrt{5}+2}$, leaving your answer in simplest form. **2**

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(b) Simplify $5\sqrt{6}-2\sqrt{24}+\sqrt{294}$, leaving your answer in simplest form. **2**

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Question 6 continues on page 6

(c) Consider the function $y = x^2 - 5x + 4$.

(i) Find the x-intercepts of $y = x^2 - 5x + 4$. **2**

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(ii) Find the coordinates of the vertex of $y = x^2 - 5x + 4$. **2**

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(iii) Sketch the graph of $y = x^2 - 5x + 4$ below, showing the intercepts and vertex. **2**

End of Question 6

Question 7 (10 marks)

(a) Find the point(s) of intersection of the lines $3x-2y=1$ and $x+2y=11$. **2**

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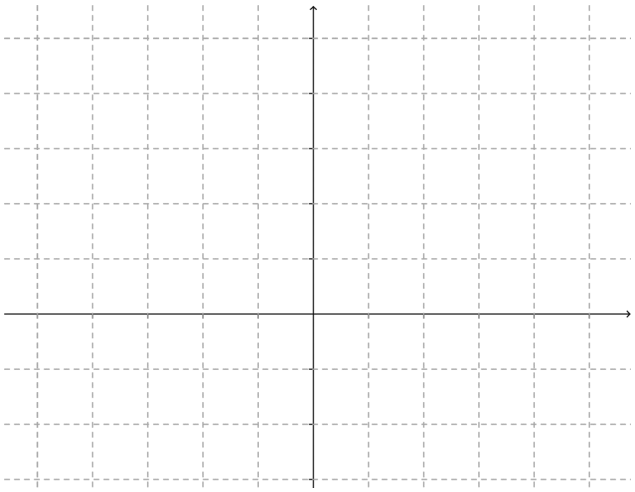
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(b) Consider the equation $|2x-1|=3$

(i) Sketch $y=|2x-1|$ on the number plane below, showing the x- and y- intercepts. **2**



(ii) Using your graph, or otherwise, solve $|2x-1|=3$. **2**

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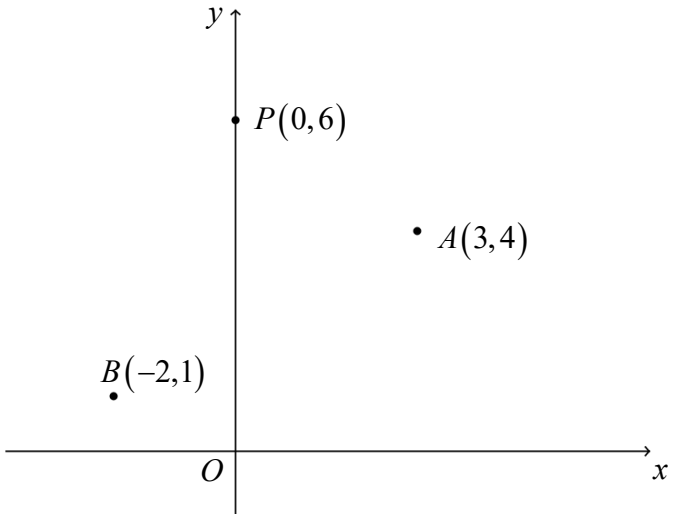
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Question 7 continues on page 8

(c) The points $A(3,4)$ and $B(-2,1)$ and $P(0,6)$ are shown in the number plane below.



NOT TO SCALE

(i) Find the equation of the line AB giving your answer in general form. **2**

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(ii) Find the equation of the line perpendicular to AB passing through P, giving your answer in the gradient-intercept form. **2**

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End of Question 7

Question 8 (9 marks)

(a) Consider the functions $f(x) = x^2$ and $g(x) = x - 3$.

(i) Evaluate $g(2)$. **1**

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(ii) Evaluate $g(f(2))$. **2**

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(iii) Find the exact values of x such that $f(g(x)) = 5$. **2**

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(b) Consider the function $f(x) = \dfrac{1}{\sqrt{2x+1}}$

(i) State the domain and the range of the function using interval notation. **2**

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(ii) The graph of $y = \dfrac{1}{\sqrt{2x+1}}$ is shifted one unit left and then 3 units up. **2**

Write down the rule for the shifted graph.

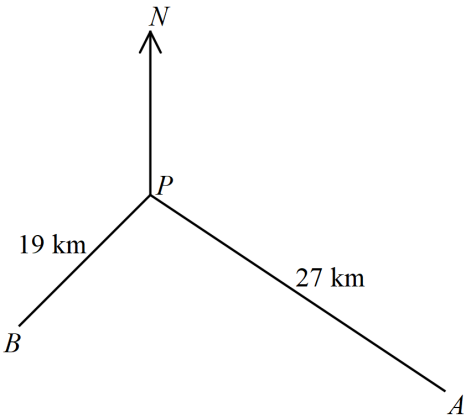
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Question 9 (10 marks)

(a) Two ships are approaching the same port, P. Ship A is 27 km away from the port, and the bearing of Ship A from P is $144°$.

Ship B is 19 km away from the port, and the bearing of Ship B from P is $227°$.



NOT TO SCALE

Find the distance between the two ships. **3**

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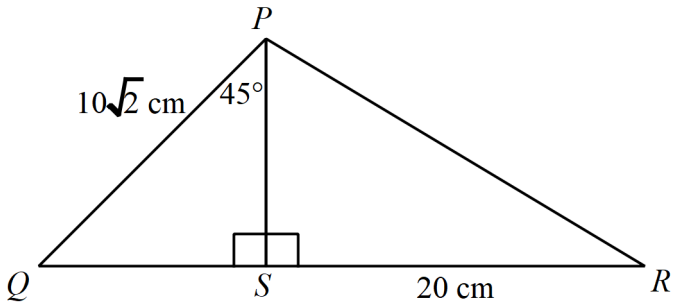
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Question 9 continues on page 11

(b) In the diagram below, $PQ = 10\sqrt{2}$ cm, $SR = 20$ cm and $\angle QPS = 45°$



NOT TO SCALE

(i) Given that $\cos 45° = \frac{1}{\sqrt{2}}$, find the length of PS. **2**

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(ii) Find the size of $\angle QPR$, correct to the nearest degree. **2**

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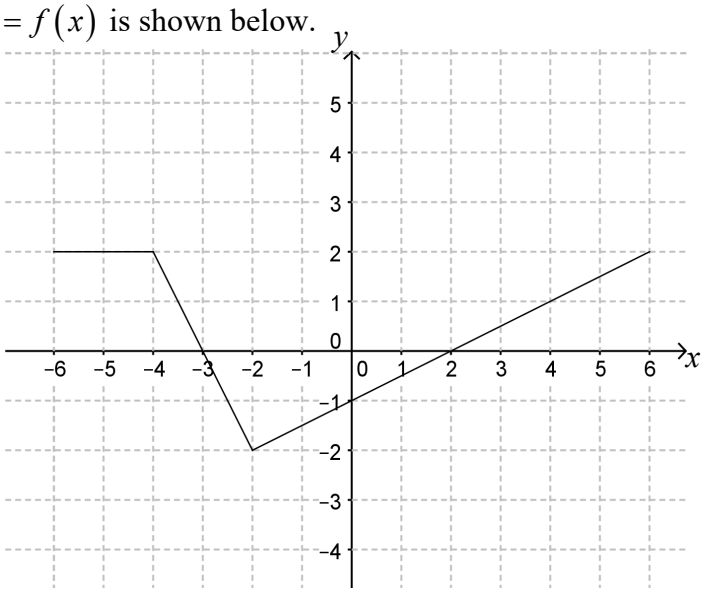
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Question 9 continues on page 12

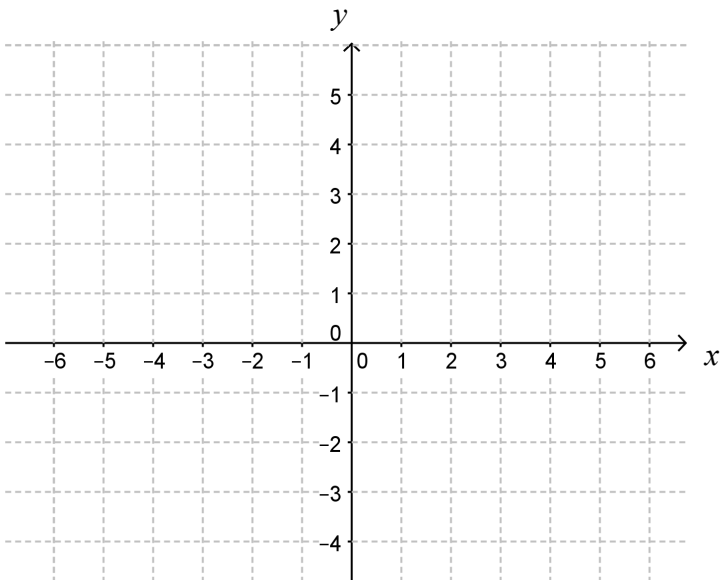
Question 9 (continued)

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

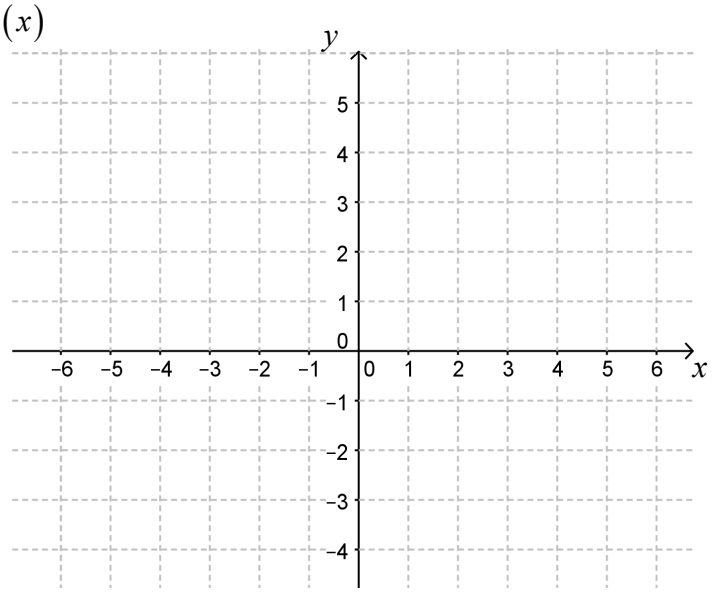


Sketch the following functions on the number planes below:

(i) $y = 2f(x)$ **2**



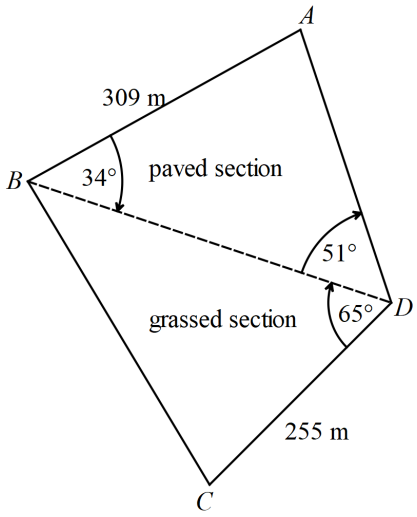
(ii) $y = -f(x)$ **1**



End of Question 9

Question 10 (11 marks)

(a) *ABCD* is a school playground. It has two sections – a paved section and a grassed section.



NOT TO SCALE

(i) Calculate the length of the boundary line, *BD*, between the two sections of playground, correct to 3 significant figures. **2**

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(ii) Find the area of the grassed section in square metres, correct to 3 significant figures. **2**

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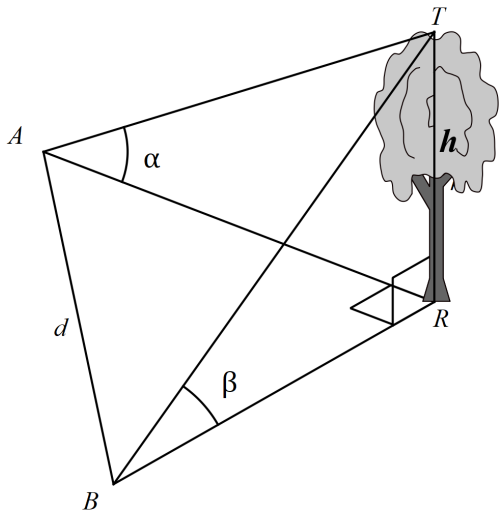
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Question 10 continues on page 14

(b) Sketch $y=(x-2)(x-3)(x+1)$, showing the x- and y- intercepts. **2**

(c) Annabelle and Bethany are trying to measure the height, h, of a vertical tree RT. They stand on horizontal ground, a distance d apart so that $\angle ARB = 90°$.

From where Annabelle is standing, A, the angle of elevation of the top of the tree is α and from where Bethany stands, B, the angle of elevation of the top of the tree is β.



NOT TO SCALE

(i) Show that $AR = \dfrac{h}{\tan\alpha}$, and similarly, find an expression for RB. **1**

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Question 10 (c) continues on page 15

(ii) By considering ΔABR, or otherwise, show that $h^2\left(\frac{1}{\tan^2\alpha}+\frac{1}{\tan^2\beta}\right)=d^2$. **2**

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(iii) Given that $d = 26\text{ m}$, $\alpha = 45°$ and $\beta = 30°$, find the height of the tree. **2**

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End of Assessment

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