HORNSBY GIRLS HIGH SCHOOL

Mathematics Extension 1

Year 11
Assessment 2 Term 2 2021

STUDENT NUMBER: _____

General Instructions

- Reading Time – 5 minutes
- Working Time – 60 minutes
- Write using black or blue pen
  Black pen is preferred
- NESA-approved calculators may be used
- In Questions 6 – 9, 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

Total marks – 43

Section I Pages 3 – 4

5 marks

Attempt Questions 1 – 5

Answer on the Objective Response Answer Sheet provided

Section II Pages 5 – 8

38 marks

Attempt Questions 6 – 9.

Question	***1-5***	***6***	***7***	***8***	***9***	***Total***
Total	*/5*	*/9*	*/9*	*/10*	*/10*	*/43*

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

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Section I

5 marks
Attempt Questions 1 – 5
Allow about 10 minutes for this section

Use the Objective Response answer sheet for Questions 1 – 5

Q1. $\sqrt{\cos^2 x}$ is simplified as

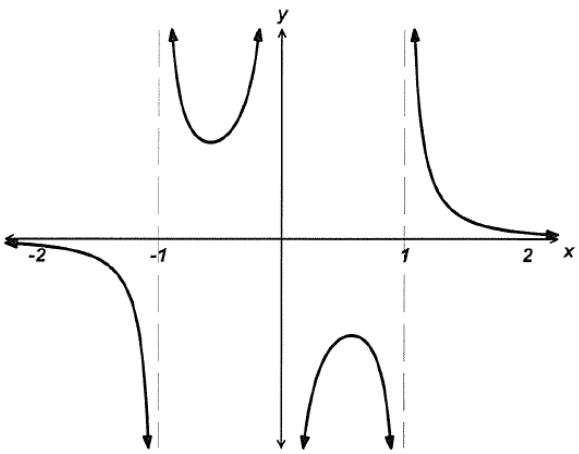
(A) $\cos x, \quad x \in R$

(B) $-\cos x, \quad x \in R$

(C) $\pm \cos x, \quad x \in R$

(D) $|\cos x|, \quad x \in R$

Q2. The graph below shows $y = \dfrac{1}{f(x)}$.



Which of the following expressions best represents $f(x)$?

(A) $f(x) = x^2 - 1$

(B) $f(x) = x(x^2 - 1)$

(C) $f(x) = x^2(x^2 - 1)$

(D) $f(x) = x^2(x^2 - 1)^2$

Q3. The domain of $g\left(f\left(x\right)\right)$ if $f\left(x\right)=-x^2$ and $g\left(x\right)=\sqrt{x}$.

(A) [0, 0]

(B) (- ∞, 0]

(C) [0, ∞)

(D) (- ∞, ∞)

Q4. The parametric form of a function is given as $x=\cos t$ and $y=\sin t+1$.

The Cartesian equation of the function is

(A) $y=x+1$

(B) $y=x^2+1$

(C) $x^2+\left(y-1\right)^2=1$

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

Q5. If $\sin\theta=\frac{13}{15}$ and $\cos\theta<0$, then the value of $\tan\theta$ is

(A) $-\frac{15}{2\sqrt{14}}$

(B) $-\frac{13}{2\sqrt{14}}$

(C) $\frac{2\sqrt{14}}{15}$

(D) $\frac{2\sqrt{14}}{13}$

End of Section I

Section II

30 marks
Attempt Questions 6-8
Allow about 50 minutes for this section

Question 6 (9 marks) **Start a new answer booklet**

(a) Solve $\frac{3x}{x-3} \leq 1$ **3**

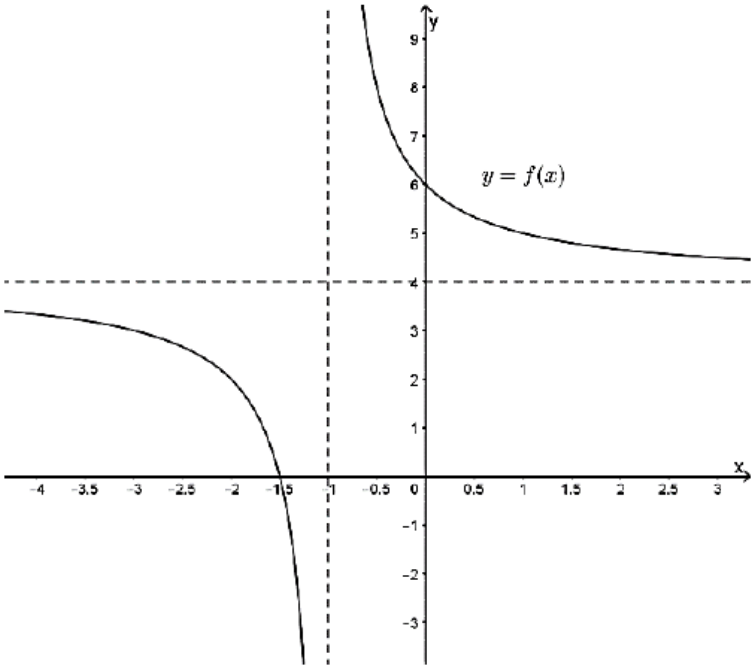
(b) Factorise $(2x-y)^3-(x+y)^3$. **2**

(c) (i) Sketch $y=|\sin x|,\ 0 \leq x \leq 2\pi$. **2**

(ii) Hence solve $|\sin x| > \frac{1}{2},\ 0 \leq x \leq 2\pi$. **2**

Question 7 (9 marks) **Start a new answer booklet**

(a) The diagram below is a sketch of the graph of the function $f(x) = 4 + \dfrac{2}{x+1}$



Use the graphs provided in the separate answer booklet, to graph the following transformations showing all asymptotes and intercepts.

(i) $y = |f(x)|$ **1**

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

(iii) $y = \sqrt{f(x)}$ **2**

(iv) $y = \dfrac{1}{2} f(x-2)$ **2**

(b) Solve $4\cos^2 x + 3\sin x = 4, \quad 0 \le x \le 2\pi$. **3**

Question 8 (10 marks) **Start a new answer booklet**

(a) (i) The graphs of $f(x)=|2x-1|$ and $g(x)=|x+1|$ are provided on the same axes in the separate answer booklet. **2**

Sketch the graph of $y=f(x)+g(x)$ on these same axes.

(ii) Find the equation of $y=f(x)+g(x)$ when $x<-1$. **1**

(iii) Solve for x: $y\geq 5$. **2**

(b) Solve $\tan 2\theta = 1, \quad -\pi \leq \theta \leq \pi$ **2**

(c) Prove that $\sqrt{\dfrac{\text{cosec}^2 x-\cot^2 x-\cos^2 x}{\cos^2 x}} = \tan x$, given that $0\leq x<\dfrac{\pi}{2}$ **3**

Question 9 (10 marks) **Start a new answer booklet**

(a) Consider the curve $f(x) = x^2 - 4x + 5$

(i) Find the largest possible positive domain of which $f(x)$ has an inverse function $f^{-1}(x)$. **1**

(ii) Find the point(s) of intersection of $y = f(x)$ and $y = f^{-1}(x)$ in the domain determined in part (i). **2**

(iii) State the domain of $y = f^{-1}(x)$. **1**

(iv) Find the equation of $y = f^{-1}(x)$. **3**

(v) For the restricted domain, sketch the function and the inverse function on the on the same number plane. **3**

Clearly label the graphs and show the main features.

End of paper