MATHEMATICS PRELIMINARY EXTENSION 1
ASSESSMENT TASK
TEST 2

COURSE/LEVEL
NSW Secondary High School Year 11 Preliminary Extension Mathematics.

TOPICS
- Basic Arithmetic (Syllabus Reference: 1.1, 1.2)
- Algebra and Surds (Syllabus Reference: 1.3)
- Equations (Syllabus Reference: 1.4, 1.4E)
- Geometry 1 (Syllabus Reference: 2.1, 2.2, 2.3, 2.4)
- Functions and Graphs (Syllabus Reference: 4.1, 4.2, 4.3, 4.4, 6.4, 8.1, 8.2)
- Straight Line Graphs (Syllabus Reference: 6.1, 6.2, 6.3, 6.5, 6.6E, 6.7, 6.7E, 6.8)

TOTAL TIME: 45 MINUTES

INSTRUCTIONS
Attempt all questions

Show all necessary working

Approved calculators may be used.

Marks may be deducted for careless or poorly arranged work

QUESTION ONE **Marks**

(a) Simplify $\sqrt{(x+2)^2 + 2x + 5}$. **2**

(b) Solve $(2x - 1)(x + 4) < 0$ by first sketching a parabola. **2**

(c) Express the following with a common denominator and simplify: **3**

$$\frac{2}{x^2 - x} + \frac{2}{x^2 - 3x + 2}.$$

(d) Find the following limits: **2**

(i) $\lim_{x \to 2} \frac{x^2 - x - 2}{x - 2}$.

(ii) $\lim_{x \to \infty} \frac{2x + 1}{3x^2 + x - 1}$.

(e) If $f(x) = x^2 + 3x - 7$, **3**

(i) find $f(-3)$,

(ii) find $f(k + 1)$ in terms of k, expressed in its simplest form,

(iii) solve for x if $f(x) = 3$.

QUESTION TWO **Marks**

(a) Let $f(x) = \dfrac{(3-x)(3+x)}{x^2-1}$. **3**

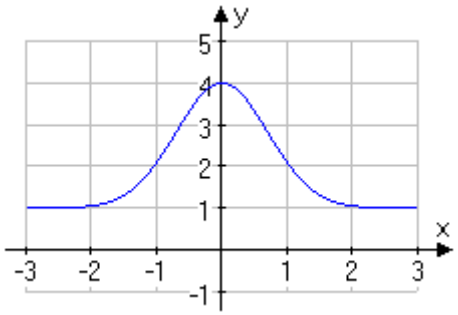
(i) Find the domain of this function.

(ii) Show that this is an even function. What does this tell you about the graph of this function?

(b) Sketch the graph of $y = \dfrac{x-2}{x-3}$ and clearly label all asymptotes and intercepts. **3**

(c) Show that the line $3x + 4y + 5 = 0$ is a tangent to the circle with centre (0, 0) and a radius of 1. **2**

(d) **1**



Shown above is a sketch of the function $y = f(x)$. The domain is all real x and the line $y = 1$ is an asymptote. The y–intercept is $y = 4$.
Write down the range of the function

(e) The angle between the straight lines $2x + y + 3 = 0$ and $y = mx + b$ is equal to θ where $\tan\theta = \sqrt{5}$. Show that **3**

$$m = \frac{\sqrt{5}-2}{2\sqrt{5}+1} \quad \text{or} \quad m = \frac{\sqrt{5}+2}{2\sqrt{5}-1}$$

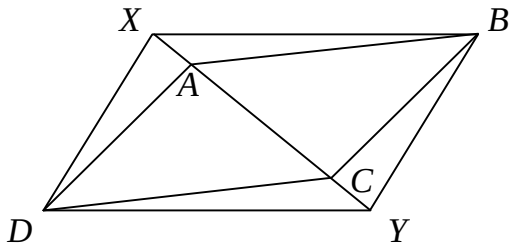
QUESTION THREE **Marks**

(a) Sketch the following on separate number planes: **3**

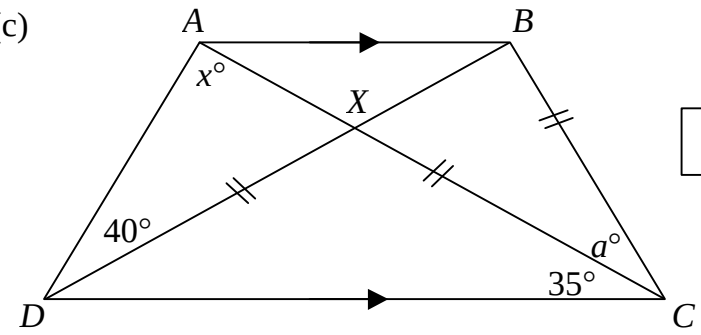
(i) $y = |x+1|$.

(ii) $|x+y| = 1$.

(b) *ABCD* is a parallelogram, *AC* is produced to *Y* and *CA* to *X* such that such that *AX* = *CY*. Prove that *XBYD* is a parallelogram. **3**



(c) **6**



NOT TO SCALE

In the diagram, *DX* = *CX* = *CB* and *AB* | | *DC*. Several angles are labelled. Give reasons for your answer to the following.

(i) Explain why Δ*AXB* is isosceles.

(ii) Name two congruent triangles in the diagram.

(iii) Find *a*.

(iv) Find *x*.