



Year 11 Mathematics Extension 1 Assessment 1 2006

Name: Answers

Teacher: _____

Time allowed: 45 minutes
Total marks: 48
Weighting: 15%

Answer on the paper provided.
Write using blue or black pen.
Show all necessary working.
Board approved calculators may be used.

Question 1:	Inequations	(3 marks)
Question 2 - 10:	Functions and Graphs	(45 marks)

1. Solve $\frac{3}{2x-1} \geq 3$

$$x \neq \frac{1}{2} \quad (1)$$

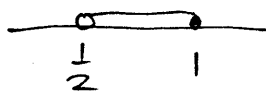
$$\text{If } \frac{3}{2x-1} = 3$$

$$3 = 3(2x-1)$$

$$2x-1 = 1$$

$$2x = 2$$

$$x = 1 \quad (1)$$



Test if $x=2 (x>1)$

$$\text{LHS} : \frac{3}{2(2)-1} = \frac{3}{3} = 1$$

$$\text{RHS} : 3$$

$$\text{LHS} \geq \text{RHS} \text{ (False)}$$

$$\text{Soln: } \frac{1}{2} < x \leq 1 \quad (1)$$

or use
multiply both side
with $(2x-1)^2$
to get solution.
(2 marks).

2. Given $f(x) = x^2 + 2$.

a. Find $f(5)$.

$$\begin{aligned} f(5) &= 5^2 + 2 \\ &= 27 \end{aligned} \quad (1)$$

b. Find $f(t+1)$.

$$\begin{aligned} f(t+1) &= (t+1)^2 + 2 \\ &= t^2 + 2t + 1 + 2 \\ &= t^2 + 2t + 3 \end{aligned} \quad (1)$$

c. Find the value of x when $f(x) = 4$.

$$f(x) = 4$$

$$x^2 + 2 = 4$$

$$x^2 = 2$$

$$x = \pm 2$$

(1) mark for either $+\sqrt{2}$ or $-\sqrt{2}$

(0) mark for 2.

3. Given $f(x) = \begin{cases} (x-3)^2 & \text{if } x < -3 \\ x+|x| & \text{if } -3 \leq x \leq 3 \\ \sqrt{16-x^2} & \text{if } x > 3 \end{cases}$

2

Find the value of $f(4) + f(-2)$.

$$f(4) = \sqrt{16 - 4^2} = 0 \quad \textcircled{1}$$

$$f(-2) = -2 + |-2| = -2 + 2 = 0$$

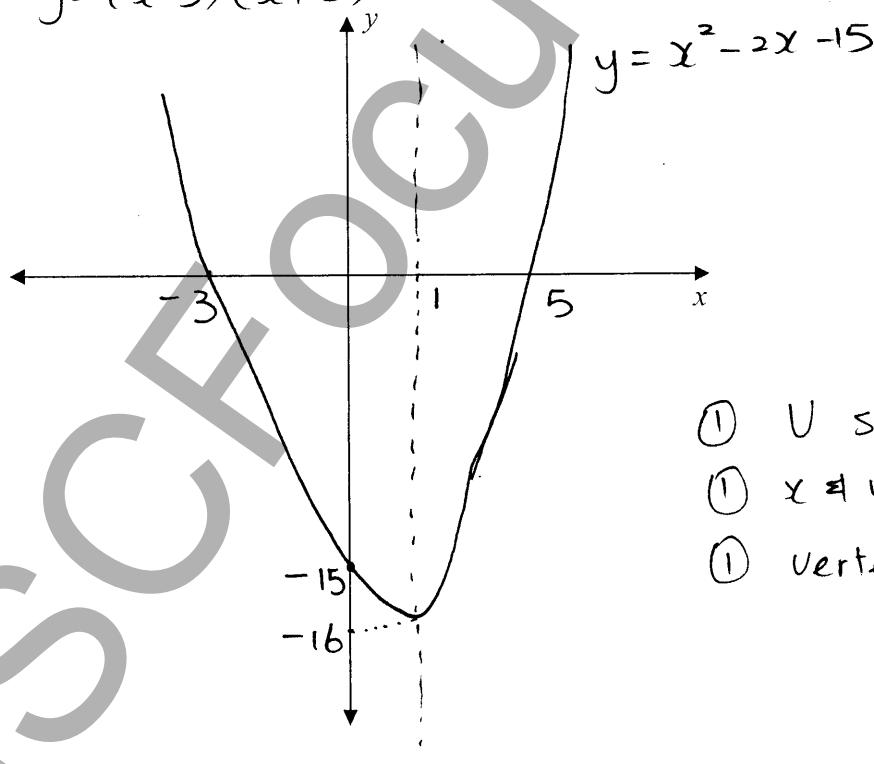
$$f(4) + f(-2) = 0 + 0 = 0 \quad \textcircled{1}$$

4.

a. (i) Sketch $y = x^2 - 2x - 15$, showing all essential features.

3

$$y = (x-5)(x+3)$$



- ① U shape
- ① x & y intercept
- ① vertex

(ii) State the domain and range of $y = x^2 - 2x - 15$.

2

$$D: \text{all real } x \quad \textcircled{1}$$

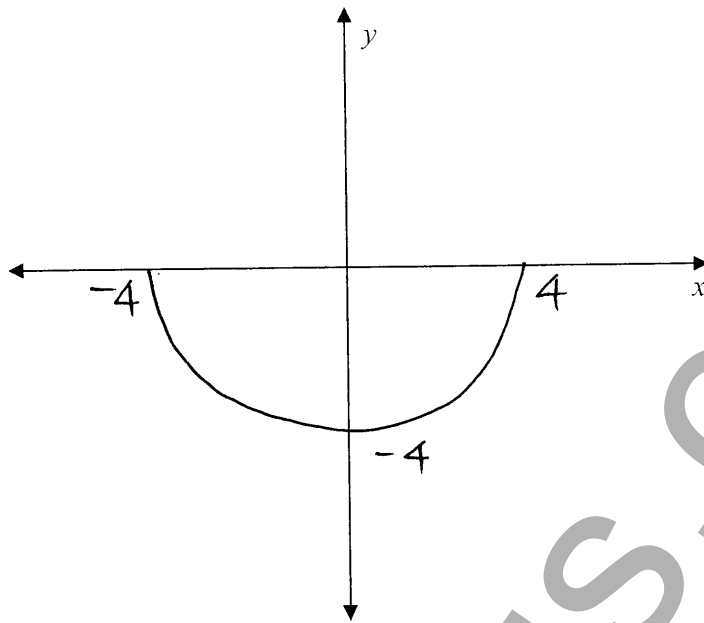
$$R: y \geq -16 \quad \textcircled{1}$$

Question 4. (continue)

Marks

- b. (i) Sketch $y = -\sqrt{16-x^2}$, showing all essential features.

2



①

① x/y intercepts.

- (ii) State the domain and range of $y = -\sqrt{16-x^2}$.

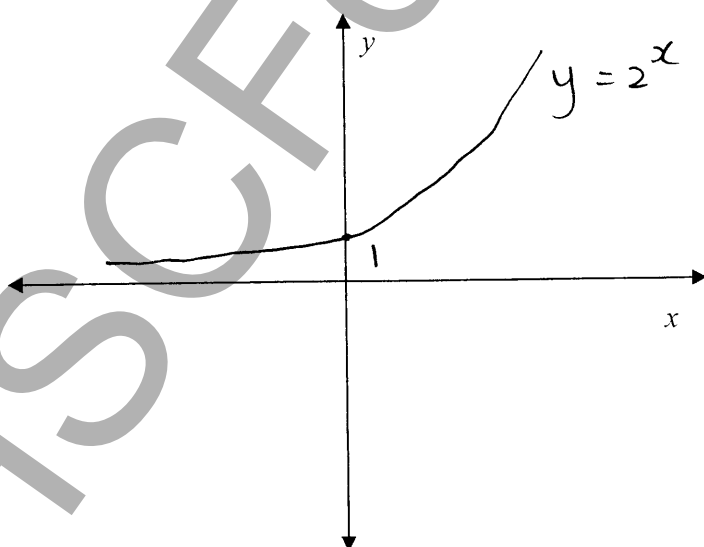
2

$D: -4 \leq x \leq 4$ ①

$R: -4 \leq y \leq 0$ ①

- c. (i) Sketch $y = 2^x$, showing all essential features.

2



①

① y-intercept

- (ii) State the domain and range of $y = 2^x$.

2

$D: \text{all real } x$ ①

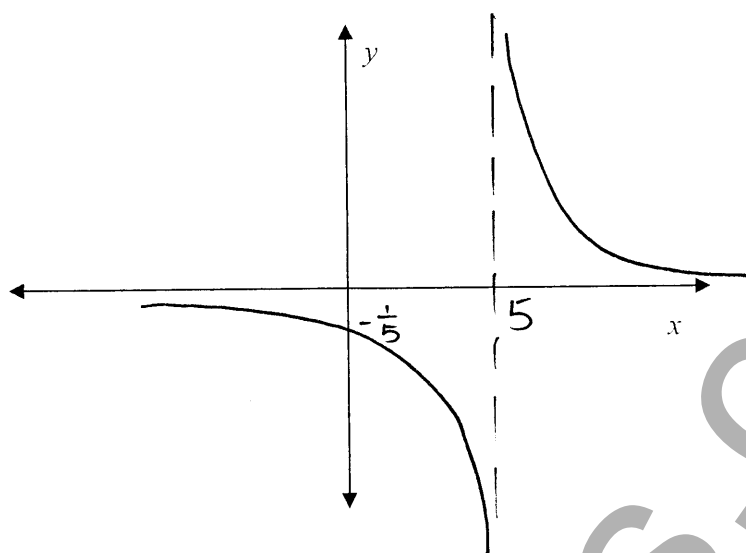
$R: y > 0$ ①

Question 4. (continue)

Marks

- d. (i) Sketch $y = \frac{1}{x-5}$, showing all essential features.

3



- ① right shape
- ① asymptote
- ① y-intercept

- (ii) State the domain and range of $y = \frac{1}{x-5}$.

2

D: all real x , $x \neq 5$ ①

R: all real y , $y \neq 0$ ①

5. Find the domain and range of the curve $f(x) = \sqrt{x^2 - 1}$.

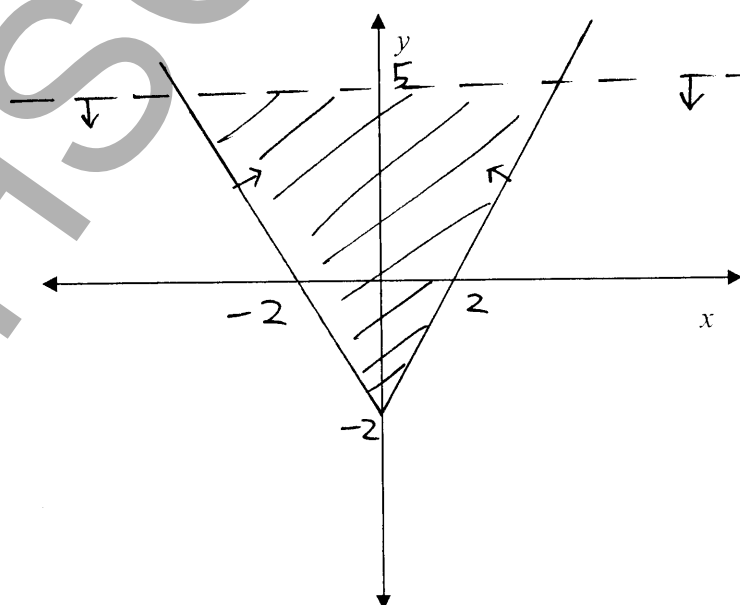
2

D: $x \leq -1$ or $x \geq 1$ ①

R: $y \geq 0$ ①

6. Find the region defined by $y \geq |x| - 2$ and $y < 5$, indicate all essential features.

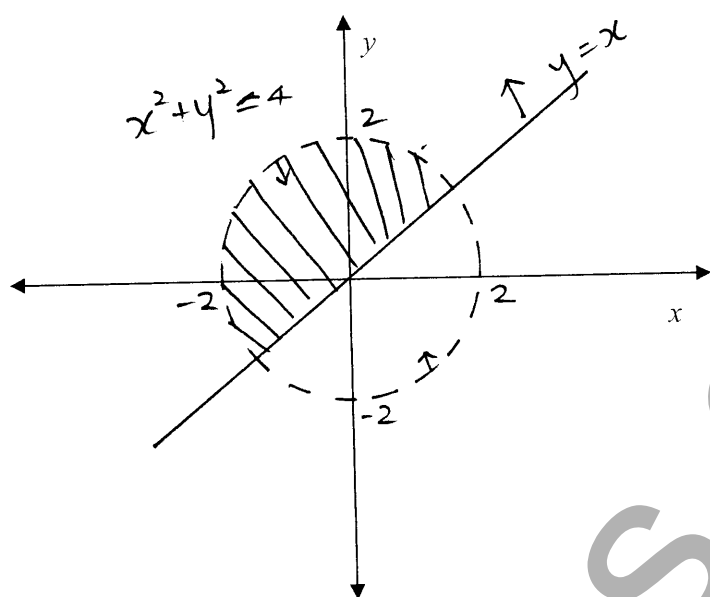
3



- ① ∇ correct shape
- ① x-y intercepts
- ① correct region

7. Sketch the region defined by $x^2 + y^2 < 4$ and $y \geq x$, indicate all essential features

3



① correct shape

② intercepts

① correct region.

8. Find $\lim_{x \rightarrow 4} \frac{x^3 - 64}{x - 4}$.

2

$$\lim_{x \rightarrow 4} \frac{(x-4)(x^2 + 4x + 16)}{x-4} \quad ①$$

$$= 4^2 + 4(4) + 16$$

$$= 48 \quad ①$$

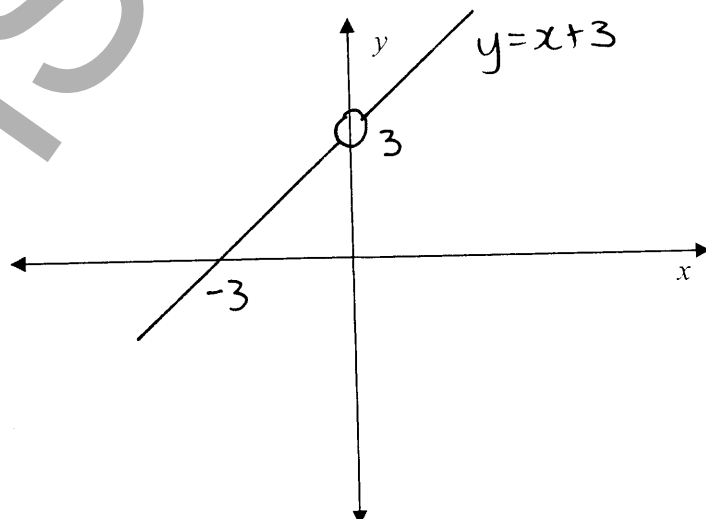
1

9.

- (i) Find $\lim_{x \rightarrow 0} \frac{x^2 + 3x}{x}$.

$$\lim_{x \rightarrow 0} \frac{x(x+3)}{x} = \lim_{x \rightarrow 0} 0 + 3 = 3 \quad ①$$

- (ii) Sketch the curve, indicating any discontinuous point.



① shape / with intercepts.

① discontinuous point.

10. Consider the function $y = \frac{4}{1-x^2} + 1$.

- a. Is the curve an odd or even function? Explain.

2

Even function (1)
Use $f(x) = f(-x)$ to proof and explain correctly. (1)

- b. Evaluate $\lim_{x \rightarrow \infty} \frac{4}{1-x^2} + 1$.

1

$$\lim_{x \rightarrow \infty} \frac{\frac{4}{x^2}}{\frac{1}{x^2} - \frac{x^2}{x^2}} + 1 = \frac{0}{0-1} + 1 = 1 \quad (1)$$

- c. Find the domain of $y = \frac{4}{1-x^2} + 1$.

2

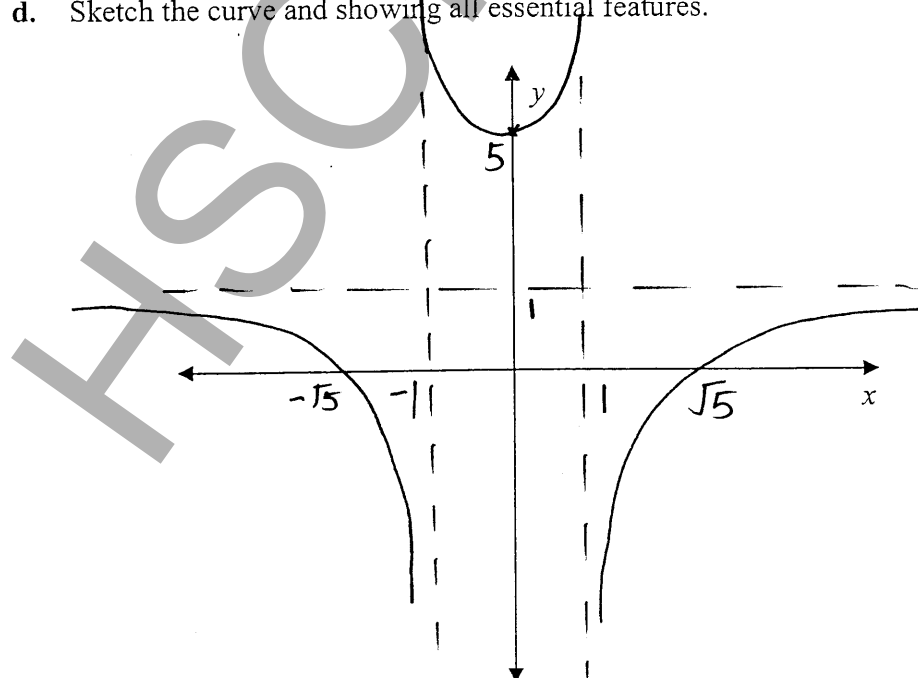
D : all real x , $x \neq \pm 1$

(1) either $x = 1$ or $x = -1$

(1) correct answer.

- d. Sketch the curve and showing all essential features.

3



(1) V vertex at 5

(1) 3 asymptote

(1) correct shape