

QUESTION ONE (13 Marks)

Marks

- (a) Simplify: $-6x^4 \times 2x^5$ 1
- (b) Factorise (i) $x^2 - x - 30$ 5
- (ii) $2x^3 - 8xy^2$
- (iii) $64x^3 - 27y^3$
- (c) Simplify: $\frac{2p-5}{p^2-5p+6} - \frac{2}{p^2-2p} - \frac{3}{p^2-3p}$ 3
- (d) Solve for x: $\frac{2}{3x} + \frac{3}{5x} = 8 - \frac{1}{x}$ 2
- (e) If $x = \frac{rh}{R-r}$, find r. 2

QUESTION TWO (13 Marks) Start a new page

- (a) The distance from the Earth to the sun is 149 492 000 km. 1
Write this number in scientific notation, correct to 4 significant figures.
- (b) Express $0.\dot{7}\dot{3}$ as a fraction in lowest terms. 2
- (c) Solve the following pair of simultaneous equations: 2

$$\begin{aligned} 2x + y &= 7 \\ x - 2y &= 1 \end{aligned}$$

- (d) Express with a rational denominator: 4
- (i) $\frac{2}{\sqrt{3}}$

D.C.W. (ii) $\frac{\sqrt{5} + \sqrt{2}}{\sqrt{5}\sqrt{2}} \times \frac{(\sqrt{5} + \sqrt{2})}{(\sqrt{5} + \sqrt{2})}$

- (e) If $x = 3 - \sqrt{5}$, find the value of $\frac{4+x^2}{2-x}$, expressing your answer with a rational denominator. 4

Question Three on Page 2 ...

QUESTION THREE (10Marks) Start a new page

Marks

(a) State the natural domain of each of the following functions: 2

(i) $f(x) = \frac{1}{3-x}$

(ii) $f(x) = \sqrt{2x-3}$

(b) Sketch each of the following, showing any intercepts with the axes, asymptotes or vertices : 8

(i) $y = -\sqrt{9-x^2}$

(ii) $y = \left(\frac{1}{2}\right)^x$ $2^{(x-y)}$

(iii) $y = -(x+1)^2 + 4$
 ~~$x = -1$~~

(iv) $y = \frac{1}{x-3}$ (1)

QUESTION FOUR (14Marks) Start a new page

(a) Solve

(i) $\frac{x}{x+1} \leq 5$ 3

(ii) $|8x-9| = 5x-7$ 3
 $\frac{11}{13} = -\frac{11}{13}$ $\left[-3 \frac{2}{3}\right] = -3 \frac{2}{3}$
 $3 \frac{2}{3} = -3 \frac{2}{3}$ -1

(b) (i) Graph: $f(x) = |x-1|$ and $f(x) = |2x+1|$ on the same number plane, showing any the point(s) of intersection . 3

(ii) Use the graphs to solve $|x-1| \leq |2x+1|$. 2

(c) Sketch the region that satisfies both the inequations - 2
 $y \leq \sqrt{4-x^2}$ and $y \geq x^2 - x$. 3

END OF PAPER

Ext 1 Ass 1 2006

21 (a) $-6x^4 \times 2x^5 = -12x^9$ * ✓

(b) (i) $(x-6)(x+5)$ * ✓ (some solved an 'equation' here)

(ii) $2x(x^2-4y^2)$ ✓
 $= 2x(x+2y)(x-2y)$ * ✓ (2)

(iii) $(4x)^3 - (3y)^3 = (4x-3y)(16x^2+12xy+9y^2)$ ✓ (1)

(c) $\frac{2p-5}{(p-3)(p-2)} - \frac{2}{p(p-2)} - \frac{3}{p(p-3)}$

$= \frac{p(2p-5) - 2(p-3) - 3(p-2)}{p(p-2)(p-3)}$ ✓ (1 CD)

$= \frac{2p^2 - 5p - 2p + 6 - 3p + 6}{p(p-2)(p-3)}$

$= \frac{2p^2 - 10p + 12}{p(p-2)(p-3)}$ ✓

$= \frac{2(p^2 - 5p + 6)}{p(p-2)(p-3)}$

$= \frac{2(p-2)(p-3)}{p(p-2)(p-3)}$

$= \frac{2(p-2)(p-3)}{p(p-2)(p-3)}$

$= \frac{2}{p}$ * ✓ (3)

(d) $(x \neq 0) (x+15x)$

$10 + 9 = 120x - 15$ ✓ (many ended up with $10x + 9x$ on RHS)

$120x = 34$

$x = \frac{17}{60}$ * ✓ (2)

(e) $x(R-r) = rh$ ✓

$xR - xr = rh$

$rh + xr = xR$

$r(h+x) = xR$

$r = \frac{xR}{h+x}$ * ✓ (2)

$$(2) (a) 1.495 \times 10^8$$

(1)

$$(b) x = 0.\overset{\circ}{7}\overset{\circ}{3}$$

$$100x = 73.\overset{\circ}{7}\overset{\circ}{3}$$

$$99x = 73$$

$$x = \frac{73}{99}$$

(2)

$$(c) x = 3, y = 1$$

(2)

$$(d) (i) \frac{2\sqrt{3}}{3}$$

(1)

$$(ii) \frac{(\sqrt{5} + \sqrt{2})^2}{3} \leftarrow (1)$$

$$~~\frac{5 + 2\sqrt{10} + 2}{3}~~ (2)$$

$$= \frac{5 + 2\sqrt{10} + 2}{3}$$

$$= \frac{7 + 2\sqrt{10}}{3} \leftarrow (2)$$

(2)

$$(e) \frac{4 + x^2}{2 - x} = \frac{4 + (3 - \sqrt{5})^2}{2 - (3 - \sqrt{5})}$$

(1)

$$= \frac{4 + 9 - 6\sqrt{5} + 5}{\sqrt{5} - 1}$$

$$= \frac{18 - 6\sqrt{5}}{\sqrt{5} - 1} \quad (1)$$

$$= \frac{6(3 - \sqrt{5})(\sqrt{5} + 1)}{5 - 1} \quad (1)$$

$$= \frac{6(3 - \sqrt{5})(\sqrt{5} + 1)}{4} \quad (1)$$

$$= 6 \frac{(3 - 5 + 2\sqrt{5})}{4}$$

$$= -3 + 3\sqrt{5}$$

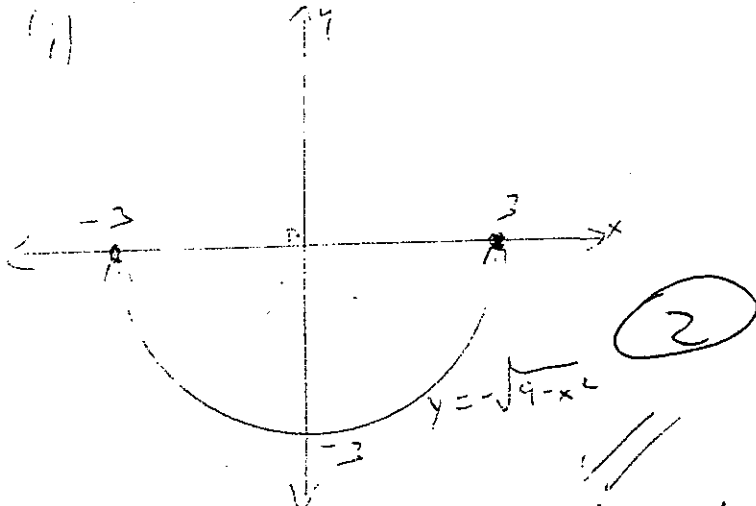
(a) (i) $f(x) = \frac{1}{3-x}$

Domain: $x \neq 3, x \in \mathbb{R}$ ✓ (1)

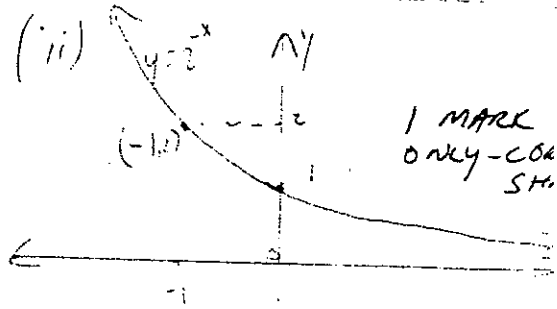
(ii) $f(x) = \sqrt{2x-3}$

Domain: $2x-3 \geq 0$
 $x \geq \frac{3}{2}$ ✓ (1)

(b) (i)

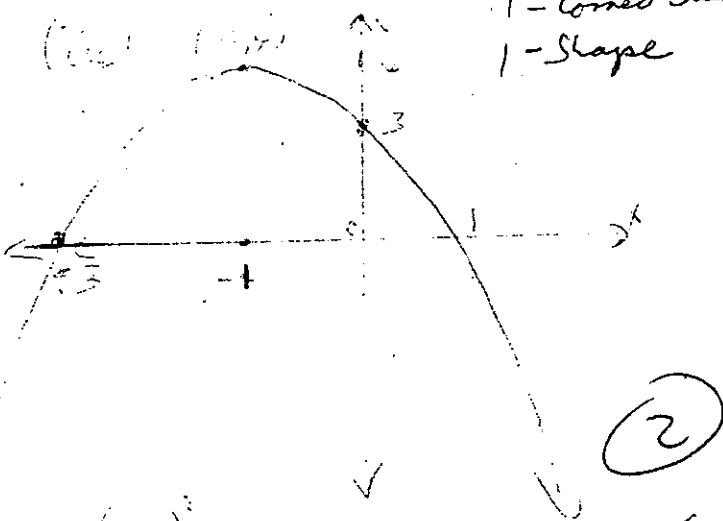


1 - Correct intercepts
 1 - Shape (10)



1 MARK
 ONLY-CORRECT
 SH.

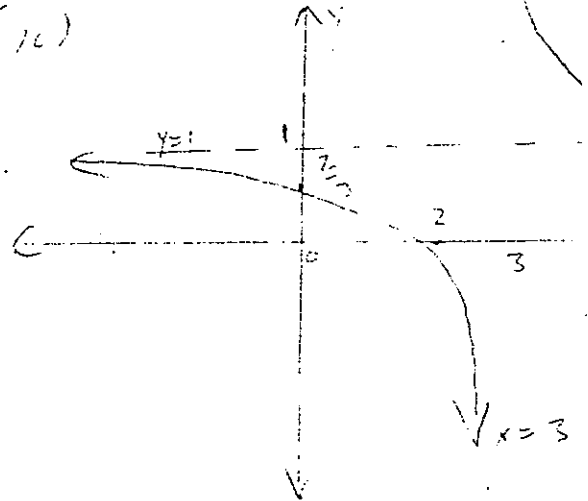
(ii)



$(x+1)^2 = 4$
 $x = -1 \pm 2$
 $x = -3$

[Both All info]

1 - All intercepts
 1 - Shape + vertices



$\frac{1}{x-3} = 1$
 $x = 4$

(3) [All info]

1 - Correct asymptotes
 1 - All intercepts
 1 - Curve

④ a)(i) $\frac{x}{x+1} \leq 5$. (But $x \neq -1$)

$x(x+1) \leq 5(x+1)^2$ ① Multiply by $(x+1)$
 $-5(x+1)^2$

$x(x+1) + 5(x+1)^2 \leq 0$

$(x+1)[x - 5x - 5] \leq 0$

$(x+1)(-4x-5) \leq 0$ ① Collect + Factors

$\therefore x > -1$ or $x > -1$

OR $x \leq -\frac{5}{4}$ ① Answers as two separate inequalities

(ii) $|8x-9| = 5x-7$ (No mark deducted for $x \neq -1$)

$8x-9 = 5x-7$ OR $-8x+9 = 5x-7$

$3x = 2$

$x = \frac{2}{3}$ ①

NOT A VALID SOLUTION

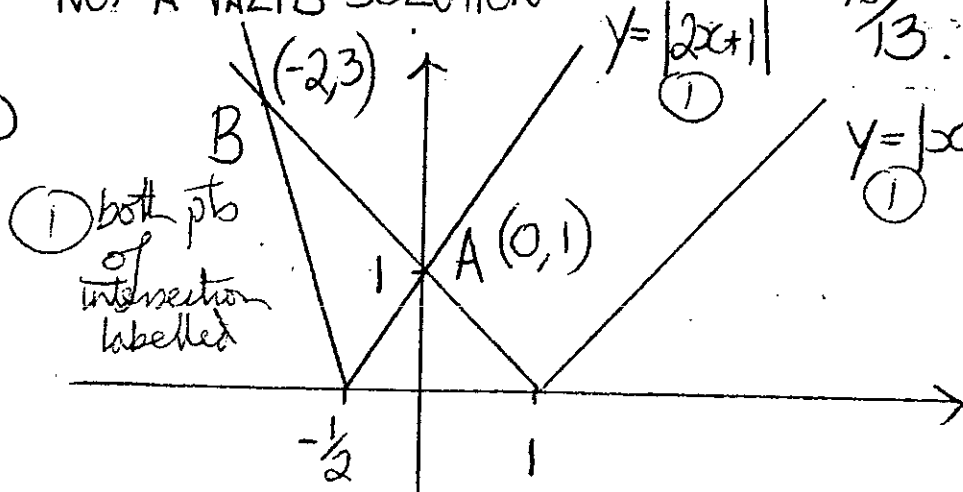
OR

$16 = 13x$

$\frac{16}{13} = x$ ①

NOT A VALID SOLUTION

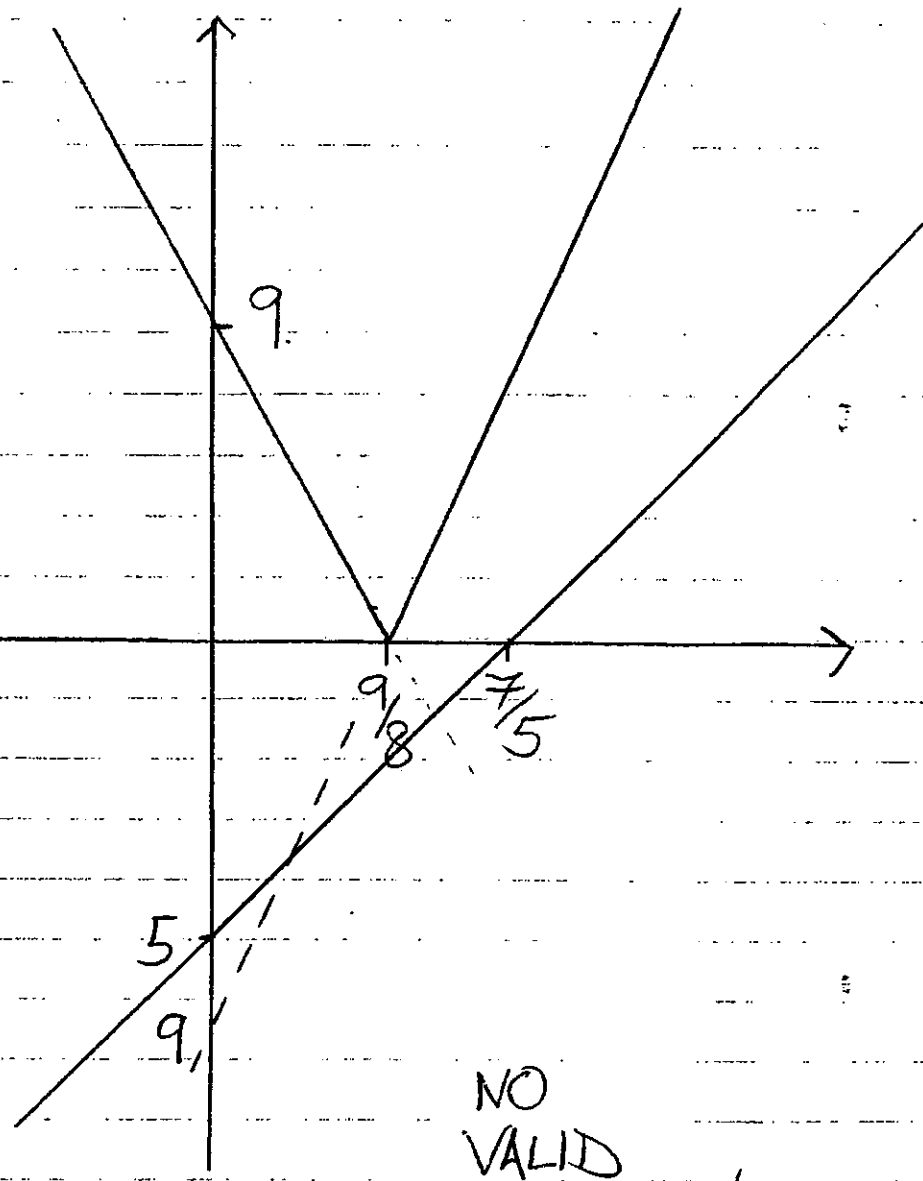
b)



① both pts of intersection labelled

① mark testing either or both to establish invalid solution

4 a) (ii)



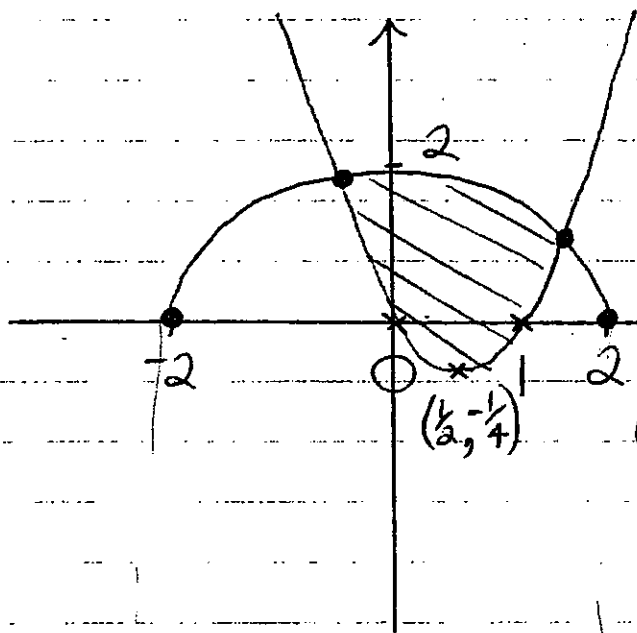
NO
VALID
SOLUTION.

Pts of intersection A (0,1) when $2x+1=1-x$
 $3x=0$
 $x=0$

B when $-2x-1=1-x$
 $-2=x$
 $(-2,3)$

(ii) $|x-1| \leq |2x+1|$ for $x \geq 0$. mark each branch
 OR $x < -2$

c)



$$y \geq x^2 - x$$

$$y \geq x(x-1)$$

Above Parabola

mark correct parabola

mark correct semicircle

mark correct shaded region

$$y \leq \sqrt{4-x^2}$$

Below Semicircle