

2006

Question 1 (20 marks)		Marks
a)	Evaluate to 3 significant figures $\frac{\sqrt{5 \cdot 7 + 2 \cdot 3^4}}{3 \cdot 6 \times 10^{-5}}$	2
b)	Find the value of an investment of \$6000 at 5.2% p.a., compounding quarterly, for 3 years.	2
c)	Rationalise the denominator $\frac{\sqrt{3}}{5 + 2\sqrt{3}}$	2
d)	Expand and simplify $(3x - 5)^2$	2
e)	Two cards are dealt from a standard pack of playing cards. What is the probability of not getting a king, queen or jack?	2
f)	A plasma television costing \$4990 is offered for sale at 10% deposit, followed by 24 monthly payments of \$235.78.	
	i) Find the total cost of the television to the customer who buys it on terms.	2
	ii) Find the total amount of interest paid.	1
	iii) Find the annual interest rate to the nearest per cent.	3
g)	If $\tan \alpha = \frac{\sqrt{5}}{8}$ find the exact value of $\sin \alpha$. (α is acute)	2
h)	Find the exact value of $\cos 225^\circ$	1
i)	$2^n + 2^n =$ A) 4^n B) 4^{2n} C) 2^{n^2} D) 2^{n+1}	1

Question 2 (16 marks) **START A NEW PAGE**

a)	Solve the following equations and Inequations	8
i)	$3x + 7 = 12x - 8$	
ii)	$\frac{4x - 3}{2} - \frac{x + 7}{5} = 4$	
iii)	$3x^2 - 7x - 8 = 0$	
iv)	$2^{5x} = 8^{x+4}$	

- b) Solve simultaneously for a and b : $3a = 2b + 4$ and $7b = 3a + 1$ 2
- c) Simplify $\frac{6x^2 - 11x - 35}{2x^2 - 7x} \div \frac{9x^2 - 25}{3x - 5}$ 3
- d) Sketch on a number plane the region represented by $y > 5x - 4$ and $x < 6$ 3

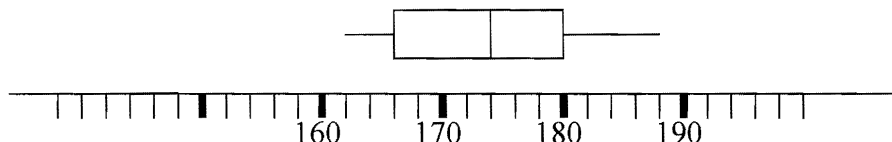
Question 3 (16 marks) START A NEW PAGE

- a) For the following data

Score	Frequency
4	3
5	10
8	6
9	9
12	2

- Find i) the mean ii) the mode
 iii) median iv) standard deviation 4

- b) The box and whisker plot below represents the results of a survey which measured the heights in centimetres, of students in year 10.



- i) Find the median.

True or false ?

- ii) 50% of the scores are between 168cm and 180cm. 4
 iii) the interquartile range is 14.
 iv) 75% of the scores are less than 180cm.

- c) The test results for 2 class tests gave the following information. 4

Test 1: mean 30 and standard deviation 5

Test 2: mean 30 and standard deviation 8

- i) Which set of scores is clustered more about the mean and why?
 ii) A student scored 36 on both tests. Which is his better result and why?

- d) A bag contains 6 black and 8 white balls. If 2 balls are drawn out 4

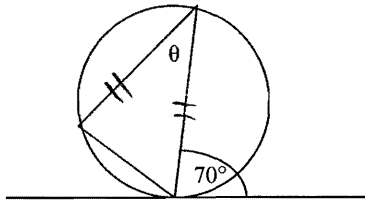
- Find i) the probability they are both the same colour.
 ii) the probability that at least one is black.

Question 4 (9 marks) START A NEW PAGE

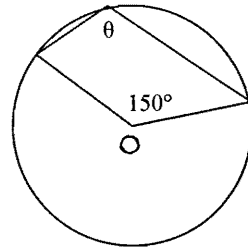
a) Find the value of the pronumeral in each case. No reasons required.

5

i)

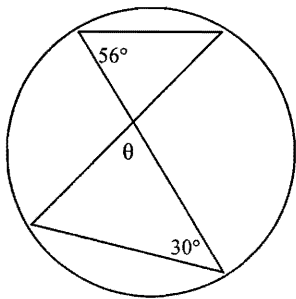


ii)

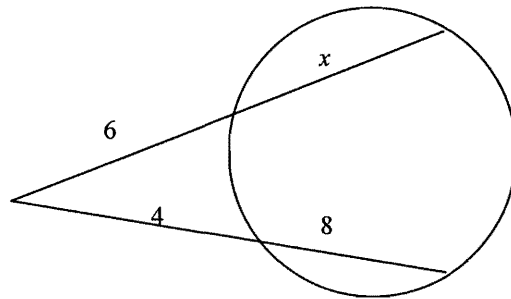


Centre O

iii)



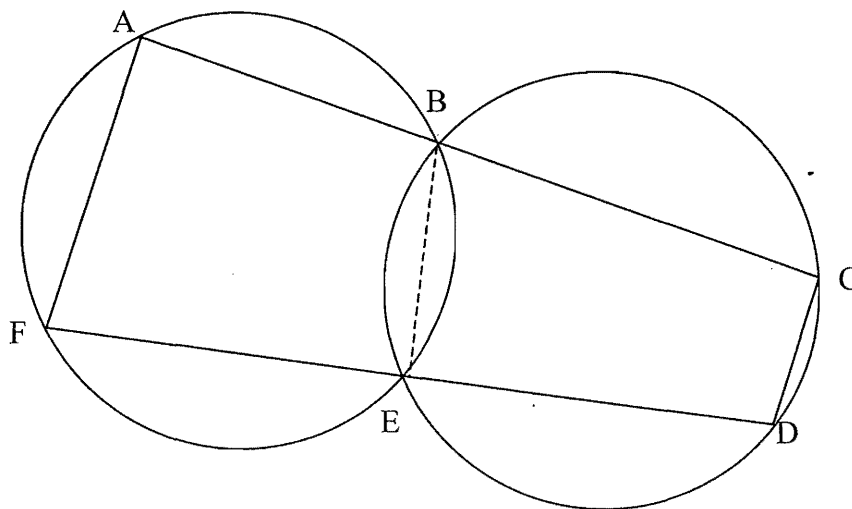
iv)

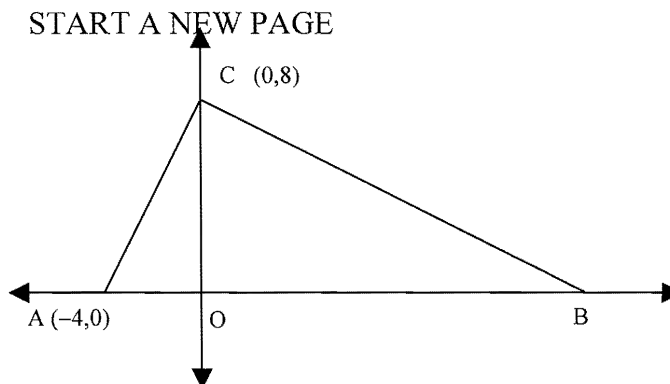


b) i) Prove $\angle AFE + \angle CDE = 180^\circ$

4

(Copy the diagram on to your answer page)

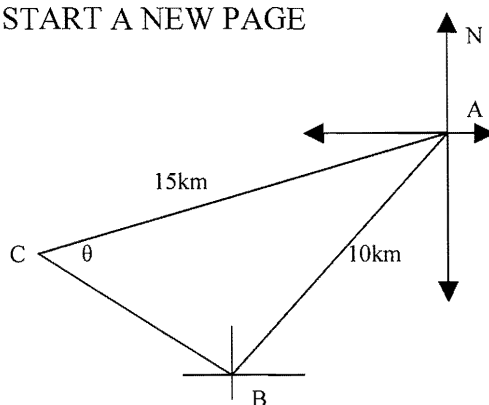


Question 5 (14 marks)

- | | | |
|----|--|---|
| a) | Prove that the coordinates of B must be (16,0). | 2 |
| b) | Find the equation of AC. | 2 |
| c) | Find D, the midpoint of AC. | 2 |
| d) | Find the equation of the line through D, drawn to E on BC, parallel to AB. | 1 |
| e) | Find the coordinates of E. | 1 |
| f) | Find the area of ΔABC . | 2 |
| g) | Find DE:AB. What geometrical property does this demonstrate? | 2 |
| h) | If AB is a tangent to a circle centre C, find the equation of the circle. | 2 |

Question 6 (13 marks) START A NEW PAGE

a)



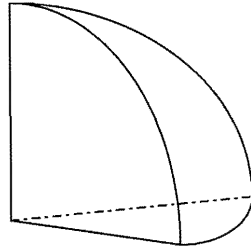
A hang glider left the top of Mt Anirudh (A) and flew 10 km on a bearing of 210°N to Mt Botica (B). From Mt Botica he flew on a bearing of 290°N to Mt Curtis (C) and then flew the 15km back to Mt Anirudh.

6

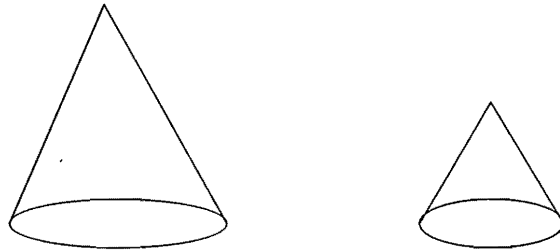
- | | | |
|-----|---|---|
| i) | Show $\theta = 41^\circ 02'$
(Hint: find the measure of $\angle ABC$ first, then use the sine rule.) | |
| ii) | Find the total distance travelled. | |
| b) | i) Sketch the curve $y = 3\sin 4\theta$ $0 \leq \theta \leq 180^\circ$ | 5 |
| | ii) Sketch the curve $y = 2 - 3\sin 4\theta$ $0 \leq \theta \leq 180^\circ$ | |
| c) | Solve the equation $\cos \alpha = \frac{-1}{2}$ $0 \leq \alpha \leq 360^\circ$ | 2 |

Question 7 (8 marks) **START A NEW PAGE**

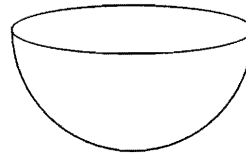
- a) Find the surface area of the one-eighth section of a sphere, radius 5cm below. 3



- b) These two cones are similar. Their heights are 15cm and 10cm. 4



- i) What is the ratio of their surface areas?
- ii) If the volume of the smaller cone is 16cm^3 , find the volume of the larger cone.
- c) A hemispherical bowl is filled at a constant rate. 1
Sketch a graph of time against the depth of the water as the bowl is being filled.

**Question 8** (23 marks) **START A NEW PAGE**

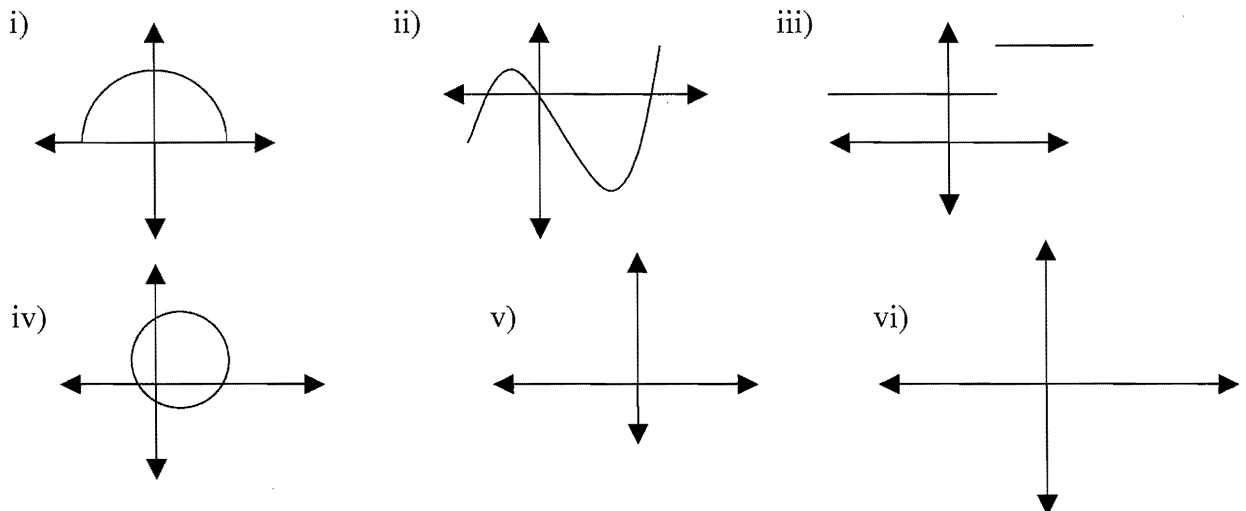
- a) A ball is thrown up in the air from a balcony on a building and follows the path represented by the equation $h = (4 + t)(8 - t)$.
 h is the height above the ground in metres and t is the time travelled in seconds.

- i) How high was the balcony when the ball was initially thrown? (i.e. when $t = 0$) 1
- ii) Sketch the parabola showing the t and h intercepts and the axis of symmetry. 3
- iii) How high and at what time was the ball at its highest point? 2
- iv) At what time did the ball hit the ground? 1

- b) Find the locus of $P(x,y)$ if P is equidistant from $A(1,5)$ and $B(6,0)$. 3
- c) Consider the equations $y = x^2$ and $y = 8x - 7$ 5
- i) Find the two points of intersection algebraically.
- ii) Show your solution graphically on a number plane.
- d) Sketch the graphs of the following, showing intercepts and any asymptotes. 8
- i) $y = 2^x$ ii) $y = \frac{1}{x+3}$ iii) $y = (x-2)^3$

Question 9 (15 marks) **START A NEW PAGE**

Consider the graphs below



- a) Which of the above graphs represent functions? 3
- b) Which of the above graphs have an inverse which is a function? 2
- c) For the function $f(x) = 3x - 8$ find:
- i) $f(6)$ ii) $f(m+2)$ iii) the value of k if $f(k^2) = 4$ 4
- d) If $f(x) = \frac{2}{x+3}$ find its inverse function $f^{-1}(x)$ 2
- e) If $f(x) = 8 - x$
- i) Show that $f^{-1}(x) = 8 - x$
- ii) By sketching $y = f(x)$ and $y = x$ on the same axis, explain why $f(x) = f^{-1}(x)$.

END OF EXAMINATION

2006 YR10 YRLY

Q1

a) $\frac{161\ 216.68}{161\ 000}$ [2]

b) 6000×1.013^{12}
 $= \$7005.91$ [2]

c) $\frac{\sqrt{3}}{5+2\sqrt{3}} \times \frac{5-2\sqrt{3}}{5-2\sqrt{3}}$
 $= \frac{5\sqrt{3}-6}{13}$ [2]

u) $-\frac{1}{\sqrt{2}}$ [1]

v) D [1]

d) $9x^2 - 30x + 25$ [2]

e) $\frac{40}{52} \times \frac{39}{51} = \frac{10}{17}$ [2]

20

f) i) $499 + 24 \times 235.78$
 $= \$6157.72$ [1]

ii) $\$1167.72$ [1]

iii) $I = 583.86/\text{yr}$ [1]

$\frac{583.86}{4491}$
 $= 13\%$ [6]

g) $\frac{\sqrt{69}}{8} \sqrt{5}$ [2]

Q 2

a) i) $3x+7=12x-8$

$$9x=15$$

$$x = \frac{5}{3} \quad (2)$$

ii) $20x-15-x-14=40$

$$18x=69$$

$$x = \frac{69}{18} = \frac{23}{6} (2)$$

iii) $3x^2-7x-8=0$

$$x = \frac{7 \pm \sqrt{49 \times 4 + 3 \times 8}}{6}$$

$$= \frac{7 \pm \sqrt{145}}{6}$$

iv) $\frac{5x}{2} = \frac{3x+12}{2}$

$$5x = 3x+12$$

$$2x = 12$$

$$x = 6$$

8

b) $3a=2b+4$ (1)

$$7b=3a+1 \quad (2)$$

(1) into (2)

$$7b=2b+5$$

$$5b=5$$

$$b=1$$

$$\therefore a=2$$

2

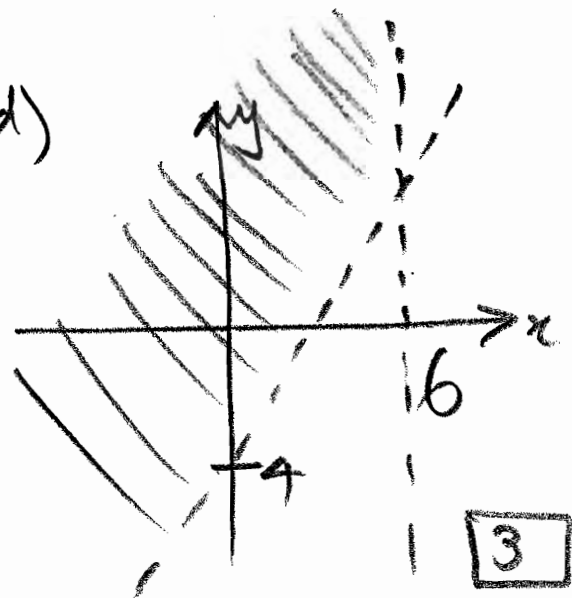
c)

$$\frac{(3x+5)(2x-7)}{x(2x-7)} \times \frac{3x+5}{(3x+5)(3x+5)}$$

$$= \frac{1}{x}$$

3

d)



3

16

Q3

a) i) 7.16

ii) 5

iii) 8

iv) 2.29%

4

b) i) 174

ii) F

iii) T

iv) T or F

4

c) Test 1 is more clustered

i) about the mean as its

standard deviation is 1,1

smaller (68% in fact

between 25-35)

ii)

Again T_1 as 56 is 1.2 SD 1,1

above mean. In T_2 it

is only 75 above the

mean

4

d)

i) $\frac{6}{14} \times \frac{5}{13} + \frac{8}{14} \times \frac{7}{13}$

$= \frac{86}{182} = \frac{43}{91}$

ii) 1 - No black

$= 1 - \frac{56}{182} = \frac{126}{182} = \frac{9}{13}$

4

16

Q4

a) i) 40°

ii) 105°

iii) 94°

iv) $6(x+6) = 12 \times 4(1)$

$x = 2(1)$

$\boxed{5}$

b)

Let $\angle AFE = x$

$\therefore \angle EBC = x$ (Ext \angle of a cyclic quadrilateral)

$\therefore \angle CDE = 180 - x$ (Opp \angle s cyclic quads)

$\therefore \angle AFE + \angle CDE = x + 180 - x = 180$

4 (-1 for each missing bit)

$\boxed{4}$

19

Q 5

a) Gradient of AC = 2
 \therefore Gradient of BC = $-\frac{1}{2}$ (1)

CO = 8 \therefore OB = 16 (1)

b) $y = 2x + 8$ (2)

c) D (-2, 4) (2)

d) $y = 4$ |

e) (8, 4) |

f) $A = \frac{1}{2} \times 20 \times 8$ |

= 80 sq units |

g) DE = 10

AB = 20

\therefore DE : AB = 1 : 2 (1)

Join of midpoints is half
the length of the parallel side
in a triangle (1)

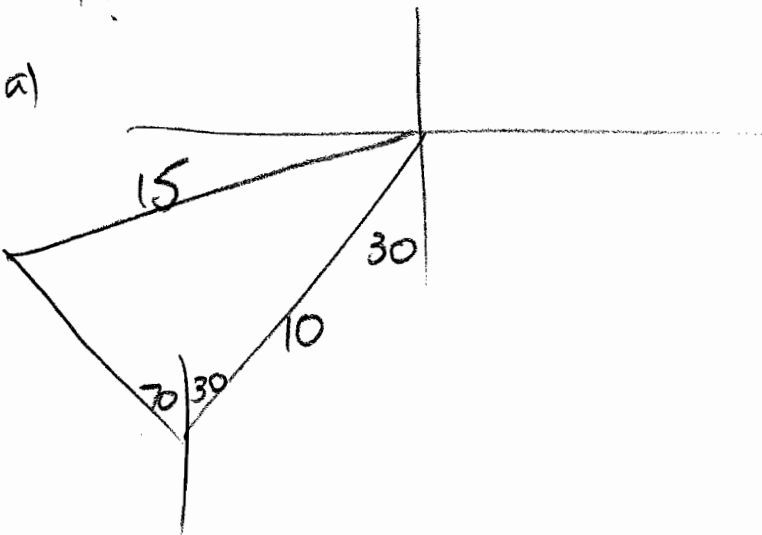
h) $x^2 - (y-8)^2 = 64$

(2)

14

Q6

a)



i) $\angle ABC = 100$ (1)

$$\frac{\sin \theta}{10} = \frac{\sin 100}{15} \quad (1)$$

$$\begin{aligned} \sin \theta &= 10 \times \frac{\sin 100}{15} \\ &= 0.6565 \quad (1) \end{aligned}$$

$$\theta = 41^\circ 2' \quad \boxed{3}$$

ii) $\angle CAB = 38^\circ 58'$

$$CB^2 = 15^2 + 10^2 - 2 \times 15 \times 10 \times \cos 38^\circ 58' \quad (1)$$

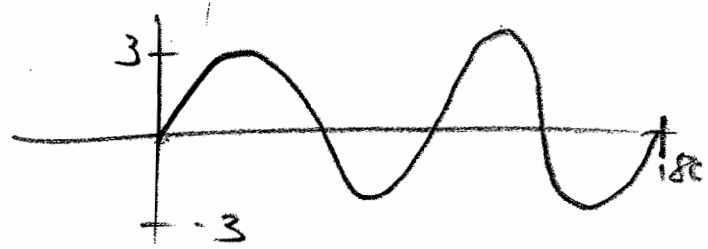
$$= 91.74$$

$$CB = 9.578 \quad (1)$$

\therefore Total distance $\hat{=}$ 34.6 km (1) $\boxed{3}$

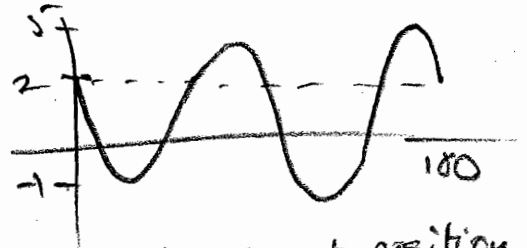
b)

i)



1 - amp
1 - period
1 - shape = $\boxed{3}$

ii)



1 - correct position
1 - correct curve

$\boxed{2}$

c)

120°
 240° $\boxed{2}$

$\frac{13}{/}$

Q7

a) $3 \times \frac{1}{4} \text{ circle} + \frac{1}{8} \text{ Surface}$

$$= \frac{3 \times \pi \times 5^2}{4} + \frac{1}{8} \times 4\pi \times 5^2$$

$$= \frac{75\pi}{4} + \frac{25\pi}{2} \quad (-1 \text{ no units})$$

$$= \frac{125\pi}{4} \text{ sq units}$$

$$\approx 98.17 \text{ sq units} \quad \boxed{3}$$

b) i) $l_1 : l_2 = 3 : 2$

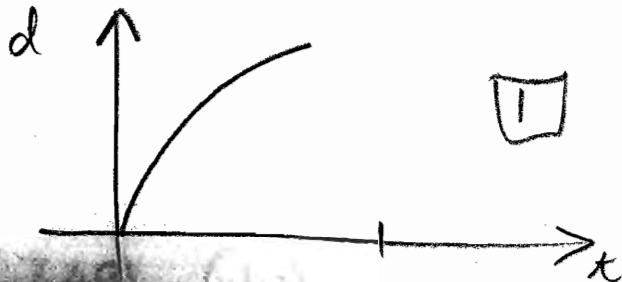
$$\therefore SA_1 : SA_2 = 9 : 4 \quad \boxed{2}$$

ii) $V_1 : V_2 = 27 : 8$

$$\therefore \frac{V_1}{V_2} = \frac{27}{8} = \frac{V_1}{16} \quad (1)$$

$$V_1 = 54 \text{ cubic units} \quad \boxed{2}$$

c)

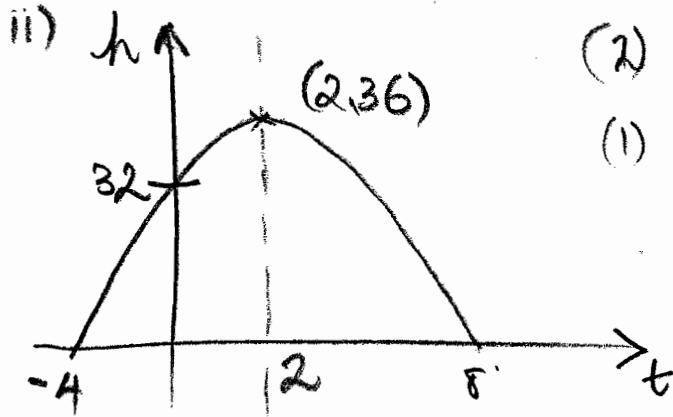


$\boxed{1}$

~~8~~

Q8.

a) i) $h = 32 \text{ m}$ |



(2) intercepts

(1) Axis of Sym.

3

iii) 36 m at 2 sec

2

iv) 8 seconds after starting

1

b) $PA = PB$

$PA^2 = PB^2$

$(x-1)^2 + (y-5)^2 = (x-6)^2 + y^2$

$x^2 - 2x + 1 + y^2 - 10y + 25 = x^2 - 12x + 36 + y^2$

$10x - 10y = 10$

$x - y = 1$

3.

c) i) $x^2 = 8x - 7$

$x^2 - 8x + 7 = 0$ (1)

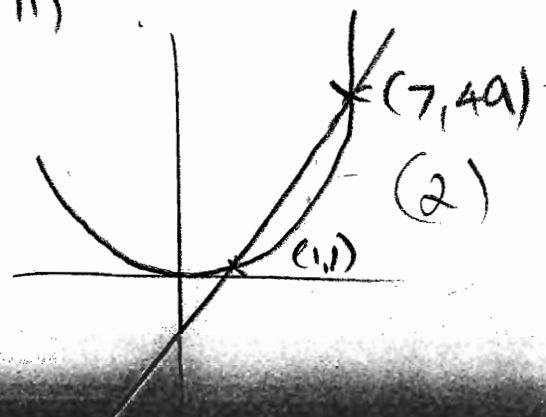
$(x-7)(x-1) = 0$

$x = 7$ or $x = 1$ (1)

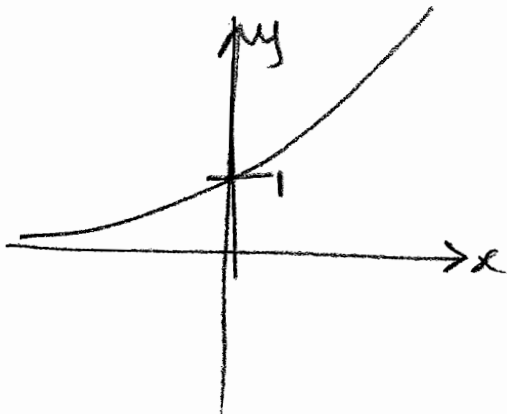
$\therefore y = 49$ $y = 1$

$(7, 49)$ $(1, 1)$ (1)

ii)



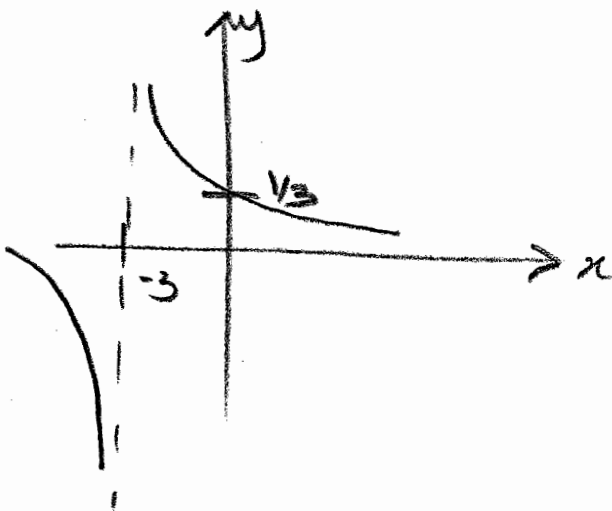
d) i) $y = 2^x$



1 intercept
1 asymptote

2

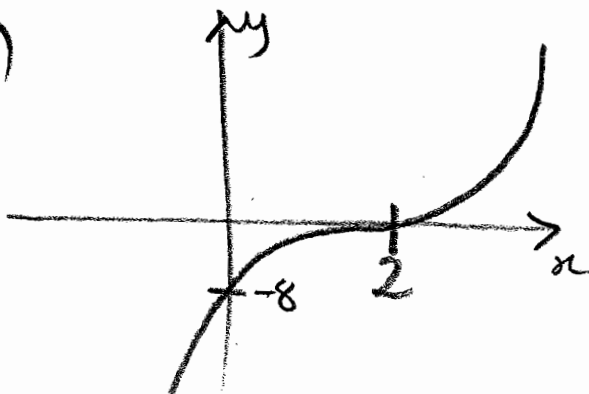
ii) $y = \frac{1}{2x+3}$



(3) 1 - intercept
1 - asymp
1 - Shape

3

iii)



2 intercepts

1 - Shape

3

23

99

a) i, ii, v, vi (-1 for each mistake) 3

b) v, vi, (-1 " " ") 2

5

c) i) 10 1

ii) $= 3(m+2) - 8$
 $= 3m - 2$ 1

iii)

$3k^2 - 8 = 4$

$3k^2 = 12$

$k^2 = 4$ 1

$k = \pm 2$ 1

2 4

d) $x = \frac{2}{y+3}$ (1)

15

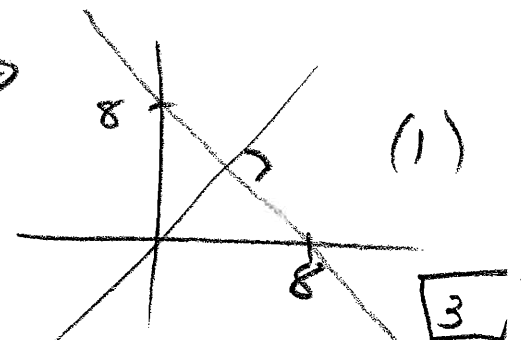
$x(y+3) = 2$

$y+3 = \frac{2}{x}$

$y = \frac{2}{x} - 3$ (1) 2

e) i) f: $y = 8 - x$

f: $x = 8 - y \Rightarrow y = 8 - x$ (1)



gradient of $y = a$ is

" " $y = b - x = -1$ (1)

" line is \perp to axis (1)

ii)