

June 1996

Paper 2

1. (a)  $72 \times 365 \times 24 \times 60 = 37\,843\,200$

Answer (a) : 37 843 200

(b)

Answer (b) :  $3.8 \times 10^7$

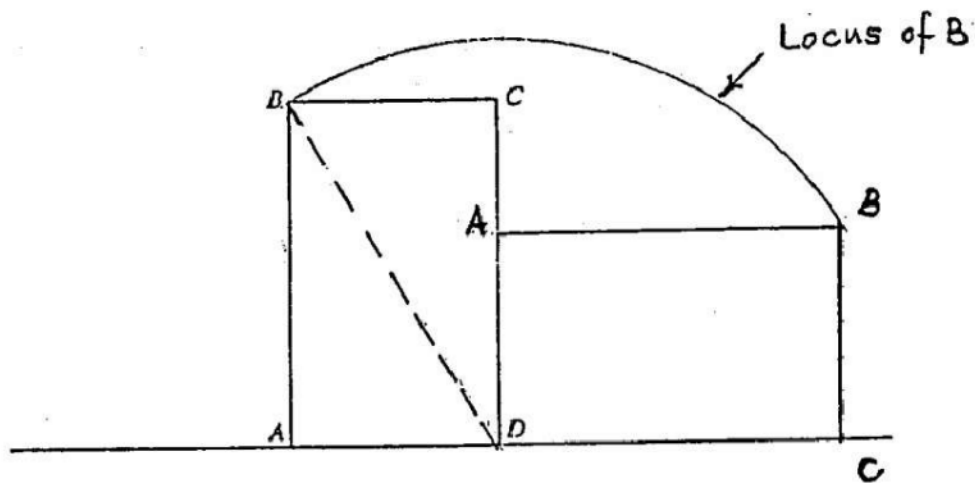
2.  $3x + 5y = 21 - 17$

$8x = 4$

$x = \frac{4}{8} = \frac{1}{2}$

Answer  $x = \frac{1}{2}$

3.



4.  $\frac{3}{17} = 0.17647$

$\frac{39}{233} = 0.16738$

$\frac{1}{6} = 0.16667$

$\frac{85}{512} = 0.16602$

Answer (a) : Smallest is  $\frac{85}{512}$

Answer (b) : Largest is  $\frac{3}{17}$

5. (a) Using calculator

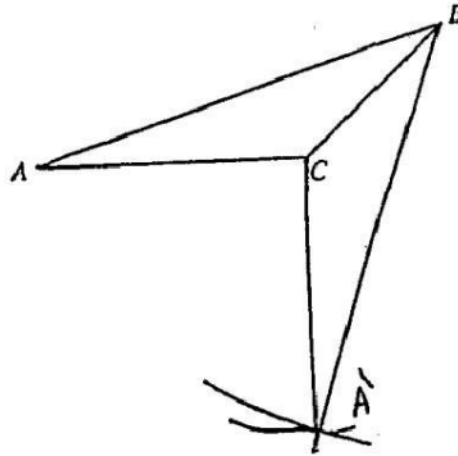
$$10 \boxed{0,.,.} 19 \boxed{0,.,.} - \frac{1}{2} = \text{shift} + \boxed{0,.,.} 0949$$

(b) Using calculator

$$11 \boxed{0,.,.} 5 \boxed{0,.,.} - 10 \boxed{0,.,.} 19 \boxed{0,.,.} = \text{shift} \boxed{0,.,.} 46 \text{ min}$$

6. Answer Angle  $ABC = 69^\circ$

7.



8.      1994            increase            1995  
        100            20                    120  
        ?                                    150  
 Answer:  $\frac{150 \times 100}{120} = 125 \text{ kg}$

9.  $1000 \text{ Swiss Francs} = 1000 \times 1105 = 1105000 \text{ lire}$   
 $1105000 - 716000 = 389000 \text{ lire}$   
 $389000 \text{ lire} = \frac{389000}{1105} = 352 \text{ Swiss Francs}$

10. Answer (a) : Trapeziem.

$$\text{Answer (b) : area} = 9 \times 5 = 45 \text{ cm}^2$$

$$11. (a) (3x+2)(4x-3) = 12x^2 - 9x + 8x - 6$$

$$\text{Answer (a)} = 12x^2 - x - 6$$

$$(b) 5x^2 - 31x + 6 = 0$$

$$(5x-1)(x-6) = 0$$

$$\text{Answer (b): } x = \frac{1}{5} \quad \text{or} \quad x = 6$$

$$12. (a) A \{2, 3, 5, 7\}$$

$$B \{3, 6\}$$

$$C \{2, 4, 8\}$$

$$\text{Answer (a) (i): } A \cap C = \{2\}$$

$$A \cup B = \{2, 3, 5, 6, 7\}$$

$$\text{Answer (a) (ii): } (A \cup B)' = \{4, 8\}$$

$$(b) \quad \text{Answer (b): } n(A) = 4$$

$$13. \quad P = \frac{Q+3R}{T}$$

$$PT = Q + 3R$$

$$PT - Q = 3R$$

$$R = \frac{PT - Q}{3}$$

$$14. (a) \text{ real length} = 10 \times 50000 \text{ cm} = 500000 \text{ cm} = \frac{500000}{100 \times 1000} = 5 \text{ km}$$

$$(b) \frac{\text{Actual area}}{\text{Map area}} = (\text{Scale})^2$$

$$\frac{\text{Actual area}}{6} = (50000)^2$$

$$\text{Actual area} = 6 \times (50000)^2$$

$$= 15000000000 \text{ cm}^2$$

$$= \frac{15000000000}{100 \times 100 \times 10000}$$

$$= 150 \text{ hectares}$$

$$\begin{aligned}
 15. \text{ Sum of all interior angles} &= (2n - 4) \times 90 \\
 &= (2 \times 6 - 4) \times 90 \\
 &= 720 \\
 \angle CDE &= \frac{720 - 160}{5} = 112^\circ
 \end{aligned}$$

$$16. (a) 8x^{\frac{1}{3}} = 8(27)^{\frac{1}{3}} = 8 \times 3 = 24$$

$$(b) \left(\frac{y}{z}\right)^{-2} = \left(\frac{z}{y}\right)^2 = \left(\frac{2}{1/3}\right)^2 = 6^2 = 36$$

$$(c) (xy)^0 = 1$$

$$17. (a) x = 360 - (120 + 135) = 105^\circ$$

$$(b) \frac{135}{360} = \frac{3}{8}$$

(c)	A	B
	120°	135°
	720	?

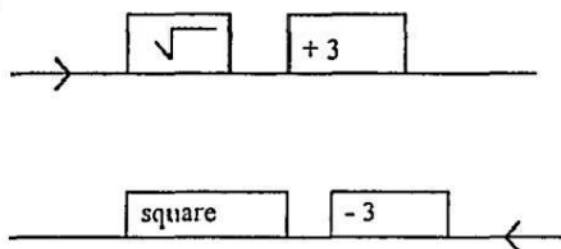
$$\text{number voted for B} = \frac{135 \times 720}{120} = 810$$

$$\begin{aligned}
 18. (a) \text{ Cos. } \angle VAO &= \frac{5}{13} \\
 \angle VAO &= 67.4^\circ
 \end{aligned}$$

$$\begin{aligned}
 (b) \text{ Curved surface Area} &= \pi r l = 3.142 \times 5 \times 13 \\
 &= 204.23 = 204 \text{ cm}^2
 \end{aligned}$$

$$\begin{aligned}
 19. (a) 3 + \sqrt{x} &= 7 & \sqrt{x} &= 7 - 3 = 4 \\
 & & x &= 4^2 = 16
 \end{aligned}$$

(b)



$$f^{-1}(x) = (x - 3)^2$$

OR

$$y = 3 + \sqrt{x}$$

$$\sqrt{x} = y - 3$$

$$x = (y - 3)^2$$

$$f^{-1}(x) = (x - 3)^2$$

20.

$$\begin{aligned} \text{(a) } m + 2n &= \begin{pmatrix} 2 \\ 3 \end{pmatrix} + 2 \begin{pmatrix} 1 \\ -1 \end{pmatrix} \\ &= \begin{pmatrix} 2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ -2 \end{pmatrix} = \begin{pmatrix} 4 \\ -1 \end{pmatrix} \end{aligned}$$

$$\begin{aligned} \text{(b) } O\vec{Q} &= O\vec{P} + P\vec{Q} \\ &= \begin{pmatrix} 1 \\ 1 \end{pmatrix} + \begin{pmatrix} 4 \\ 1 \end{pmatrix} = \begin{pmatrix} 5 \\ 2 \end{pmatrix} \end{aligned}$$

$$\text{(c) } |m| = \sqrt{2^2 + 3^2} = \sqrt{13} = 3.61$$

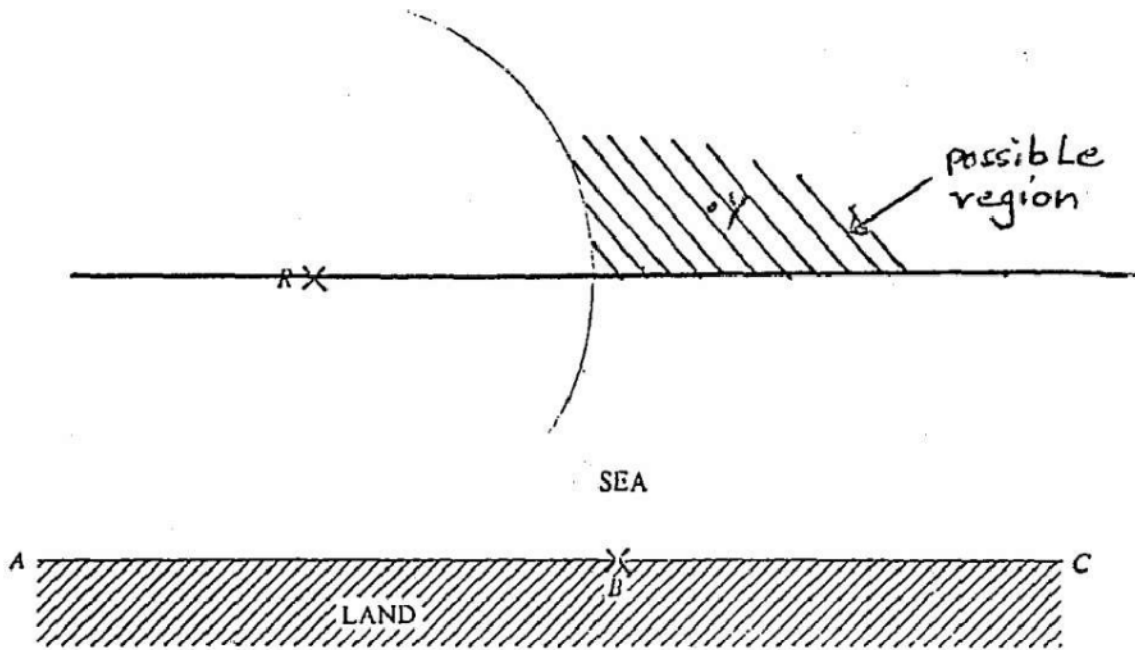
$$21. \text{ (a) Answer (a): } \hat{BDO} = 20$$

$$\text{(b) Answer (b): } \hat{BDA} = 90^\circ$$

$$\text{(c) Answer (c): } \hat{OAD} = 70^\circ$$

$$\text{(d) Answer (d): } \hat{BCD} = 110^\circ$$

22.



23. (a) (i) acceleration =  $\frac{7}{4} = 1.75$  m/s

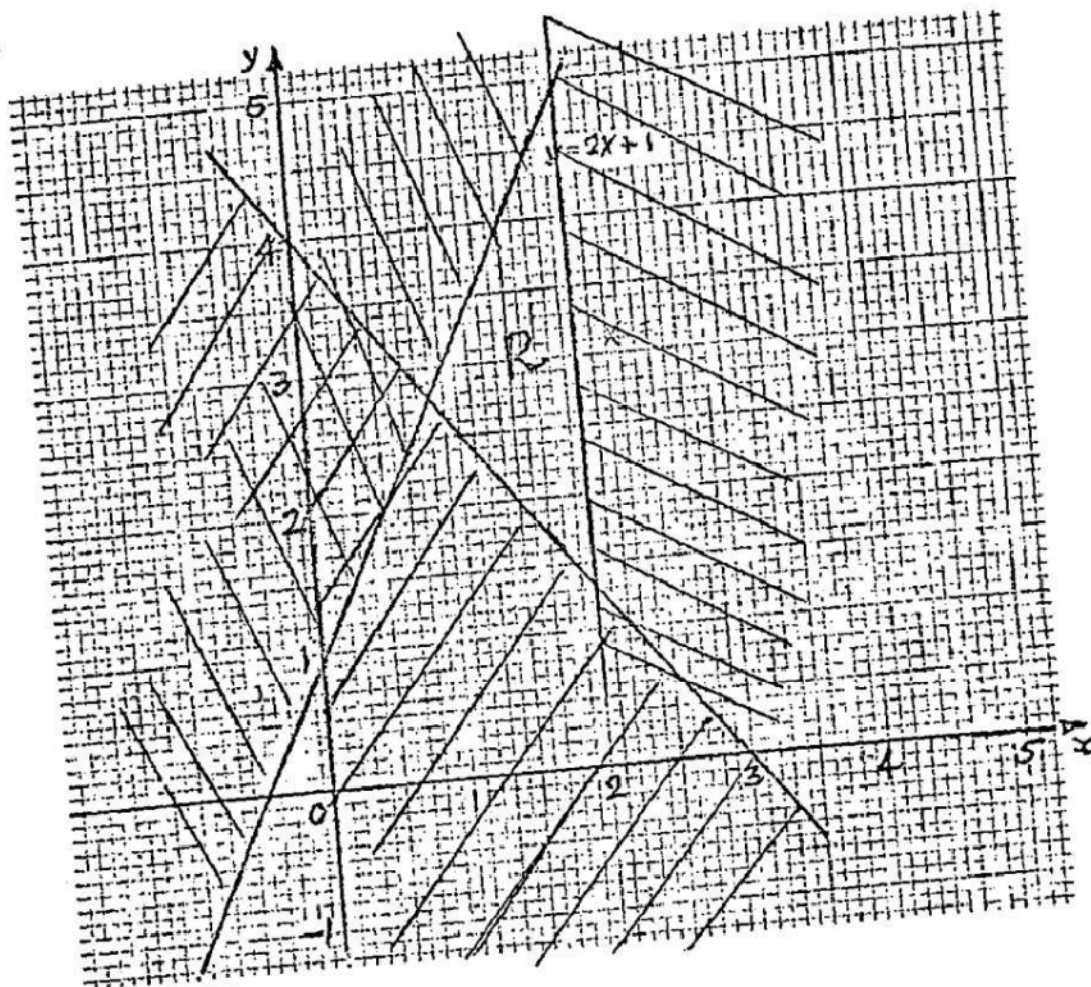
(ii) acceleration = zero

(b) Distance = area =  $\frac{12+16}{2} \times 7 = 98$  m

(c) Distance is rough by equal the area of a triangle base (24 - 16) and height 7

$$\text{distance} = \frac{1}{2} \times 8 \times 7 = 28 \text{ m.}$$

24.



(a)  $3y + 4x = 12$

$x = 0$

$y = 0$

$y = 4$

$x = 3$

(0|4)

(3|0)

(b) Solution is the point intersection i.e.  $x = 0.9$ ,  $y = 2.8$

Nov. 96Paper 2

1.	grams	calories
	84	60
	98	?

$$\frac{98 \times 60}{84} = 70 \text{ calories}$$

$$\begin{aligned} 2. \quad & 3 - 4x < 11 \\ & -4x < 11 - 3 \\ & -4x < 8 \\ & x > \frac{8}{-4} \\ & x > -2 \end{aligned}$$

$$3. \quad (a) \quad 12 \times 1 \frac{3}{4} = 21 \text{ pints}$$

$$(b) \quad 8 \div 1 \frac{3}{4} = 4 \frac{4}{7} = 4.57 \text{ Litres}$$

4. Translation to the right (parallel to x axis) of magnitude 4.

$$\begin{aligned} 5. \quad & y = k x^n \\ x = 1 \quad & y = 0.5 \\ & 0.5 = k (1)^n = k \\ & k = 0.5 \\ & y = 0.5 x^n \\ & n = 3 \end{aligned}$$

$$\begin{aligned} x = 2 \quad & y = 4 \\ & 4 = 0.5 (2)^n \\ & \frac{4}{0.5} = 2^n \\ & 8 = 2^n \Rightarrow n = 3 \end{aligned}$$



6.  $x(x+1) = 756$

$$x^2 + x - 756 = 0$$

$$(x+28)(x-27) = 0$$

$$x = 27$$

numbers are 27 & 28

OR Using calculator find  $\sqrt{756} = 27.5$

multiply  $27 \times 28 = 756$

7. (a) 

cost	tax	bill
100	15	115
?		48.30

$$\text{Cost} = \frac{48.30 \times 100}{115} = \$42$$

(b)  $\text{tip} = \frac{8}{100} \times 48.30 = 3.864 \cong \$4$

8. (a)  $\text{speed} = \frac{207}{3 \times 60} = 1.15 \text{ m/min}$

(b)  $\text{speed} = \frac{207 \times 100}{3 \times 60 \times 60} = 1.92 \text{ cm/s}$

9. (a)  $27^{2/3} = 9$

(b)  $x^{-3} = 8$

$$\frac{1}{x^3} = 8$$

$$x^3 = \frac{1}{8}$$

$$x = \frac{1}{2}$$

10. (a)  $x^2 - (x-4)^2 = 112$

(b)  $x^2 - (x^2 - 8x + 16) = 112$

$$8x - 16 = 112$$

$$8x = 128$$

$$x = 16$$

11. (a) 65 grams

$$(b) \text{Least } M = 50 + 4 \times 65 = 310$$

$$\text{Greatest } M = 50 + 6 \times 75 = 500$$

$$310 \leq M < 500$$

12. (a) has a rotational symmetry of order 4.

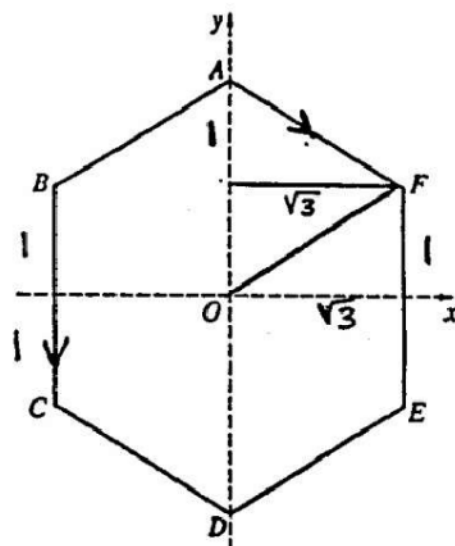
$$(b) \frac{3}{4}$$

$$13. (a) |\vec{OF}| = \sqrt{(\sqrt{3})^2 + (1)^2}$$

$$= \sqrt{4} = 2$$

$$(b) (i) \vec{AF} = \begin{pmatrix} \sqrt{3} \\ -1 \end{pmatrix}$$

$$(ii) \vec{BC} = \begin{pmatrix} 0 \\ -2 \end{pmatrix}$$



$$14. (a) E = mc^2 = 20 \times (3 \times 10^8)^2$$

$$E = 1.8 \times 10^{18}$$

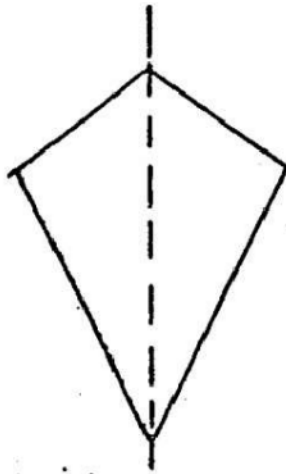
$$(b) E = mc^2$$

$$c^2 = \frac{E}{m}$$

$$c = \sqrt{\frac{E}{m}}$$

15.

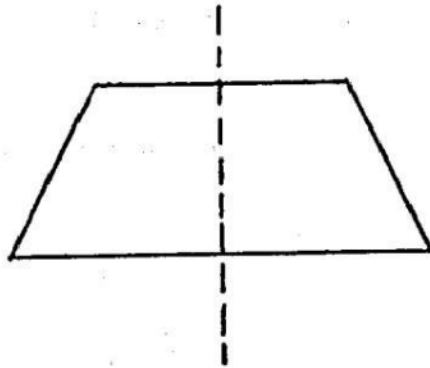
QUADRILATERAL A



Name

Kite

QUADRILATERAL B



Name

Trapezium

$$16. (a) f\left(\frac{1}{6}\right) = 3\left(\frac{1}{6}\right)^2 - 3\left(\frac{1}{6}\right) + 1 = \frac{7}{12}$$

$$\begin{aligned} (b) f(1-x) &= 3(1-x)^2 - 3(1-x) + 1 \\ &= 3(1-2x+x^2) - 3 + 3x + 1 \\ &= 3 - 6x + 3x^2 - 3 + 3x + 1 \\ &= 3x^2 - 3x + 1 = f(x) \end{aligned}$$

$$(c) f\left(\frac{5}{6}\right) = f\left(\frac{1}{6}\right) \text{ (from (b))} = \frac{7}{12}$$

$$\text{Or } f\left(\frac{5}{6}\right) = 3\left(\frac{5}{6}\right)^2 - 3\left(\frac{5}{6}\right) + 1 = \frac{7}{12}$$

$$17. (a) (i) \frac{ST}{\sin 33^\circ} = \frac{5}{\sin 12^\circ}$$

$$ST = \frac{5 \times \sin 33^\circ}{\sin 12^\circ} = 13.1 \text{ km}$$

$$(ii) \text{Speed} = \frac{13.1}{\left(\frac{1}{2}\right)} = 26.2 \text{ km/h}$$

$$(b) \text{ Bearing} = 270 - 12 = 258^\circ$$

18. Regular 24 sided polyzon

$$\text{exterior angle} = \frac{360}{24} = 15^\circ$$

$$\text{interior angle} = 180 - 15 = 165^\circ$$

Regular octagon

$$\text{exterior angle} = \frac{360}{8} = 45^\circ$$

$$\text{interior angle} = 180 - 45 = 135^\circ$$

Equilateral triangle

$$\text{each angle} = 60^\circ$$

$$165^\circ + 135^\circ + 60^\circ = 360^\circ$$

Therefore, it fit together exactly at x.

19. (a) 3.5 min

$$(b) \text{ acceleration} = \frac{15}{0.5} = 3 \text{ km} / \text{min}^2$$

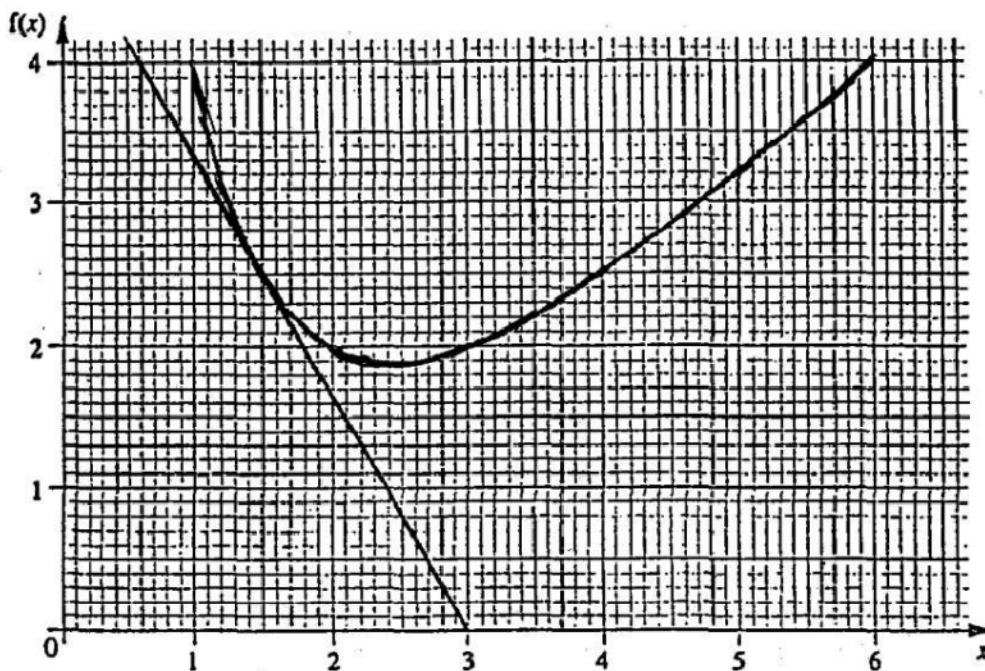
$$(c) (i) \text{ distance} = \text{Area} = \frac{1}{2} \times 0.5 \times 1.5 = 0.375 \text{ km}$$

$$(ii) \text{ distance} = \text{total area} = \frac{3.5+5}{2} \times 1.5 = 6.375 \text{ km}$$

20. (a)

x	1	1.2	1.5	2	3	4	5	6	2.5
f(x)	4	3.2	2.5	2	2	2.5	3.2	4	1.9

(b)



(c) points on the tangent (1 , 3.3) and (3 , 0)

$$\text{gradient} = \frac{3.3 - 0}{1 - 3} = \frac{3.3}{-2} = -1.65$$
$$\cong -1.7$$