

**QUESTION 1:** (12 Marks) [**START A NEW PAGE**]

(a) Solve the equation  $5(x-2) - 6 = 29$ .

(b) Simplify  $\frac{1}{x-2} - \frac{1}{x}$ .

(c) Find  $\log_5 12$  correct to 2 decimal places.

(d) Factorise fully (a)  $9y^2 - 36$ .  
(b)  $2t^2 - 7t + 6$ .

(e) Given that  $p$  and  $q$  are rational, find the value of  $p$  if  $2\sqrt{3}(4+\sqrt{3}) = p + q\sqrt{3}$ .

**QUESTION 2:** (12 Marks) [**START A NEW PAGE**]

The co-ordinates of the points A, B and C are  $(-4,3)$ ,  $(0,5)$  and  $(9,2)$  respectively.

(a) Find the length of the interval BC.

(b) Show that the equation of the line  $l$ , drawn through A and parallel to BC is  $x + 3y - 5 = 0$ .

(c) Find the co-ordinates of D, the point where the line  $l$  meets the x-axis.

(d) Prove that ABCD is a parallelogram.

(e) Find the perpendicular distance from the point B to the line  $l$ .

(f) Hence or otherwise find the area of parallelogram ABCD.

**QUESTION 3:** (12 Marks) [**START A NEW PAGE**]

(a) Find the derivatives, leaving your answer in simplest form:

(i)  $4x\sqrt{x}$ .

(ii)  $x \tan x$ .

(iii)  $\frac{4x-1}{2x+3}$ .

(b) Find, leaving your answer in exact form:

(i)  $\int_0^4 \frac{1}{3x+2} dx$ .

(ii)  $\int_4^9 \frac{6}{x\sqrt{x}} dx$

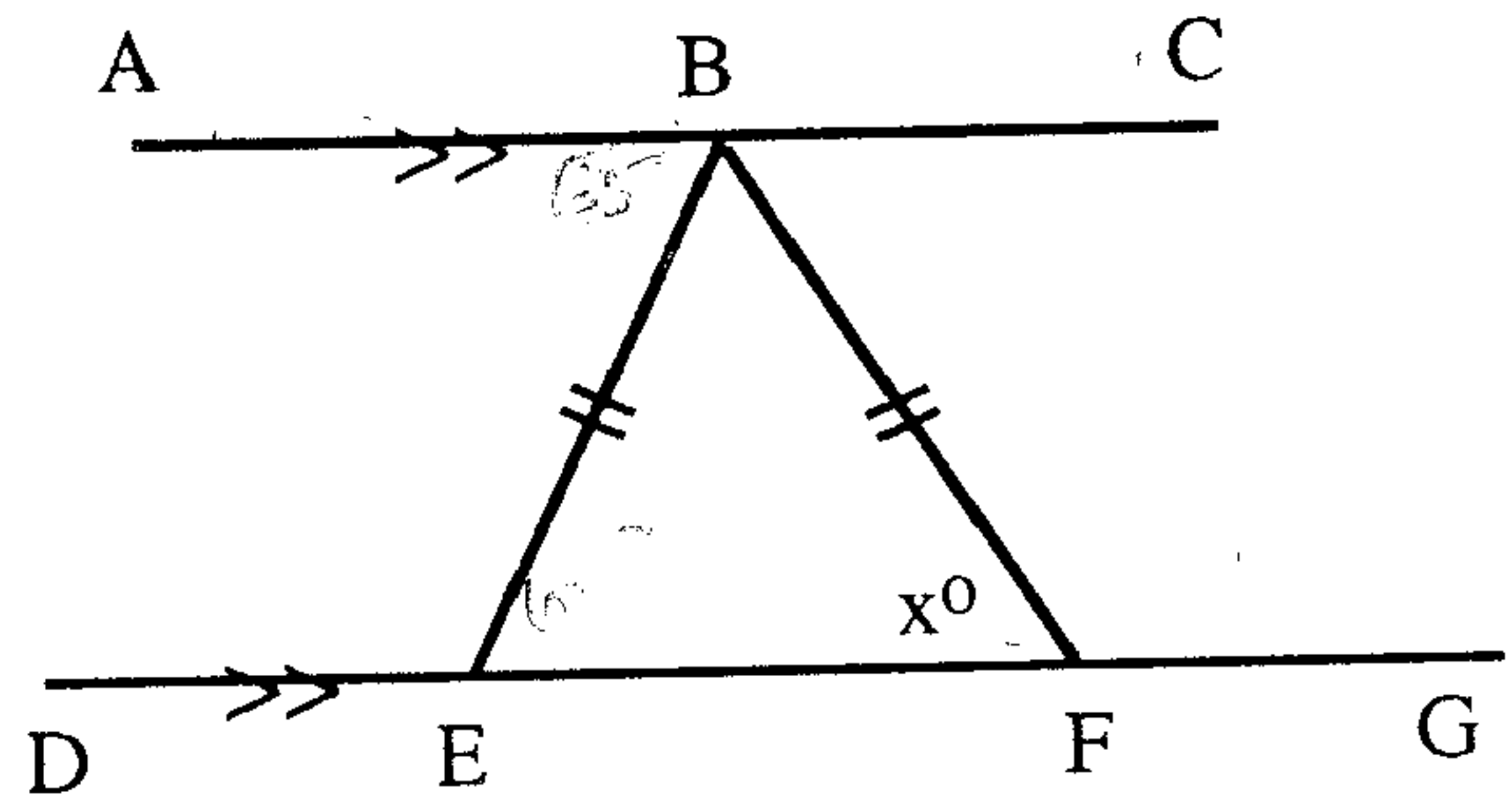
(c) A curve has gradient function  $\frac{dy}{dx} = e^{3x}$ . Find the equation of the curve if it passes through the point (0,2).**QUESTION 4:** (12 Marks) [**START A NEW PAGE**]For the parabola  $y = \frac{1}{8}x^2 - x + 3$ ,

(a) Find the co-ordinates of the vertex and focus.

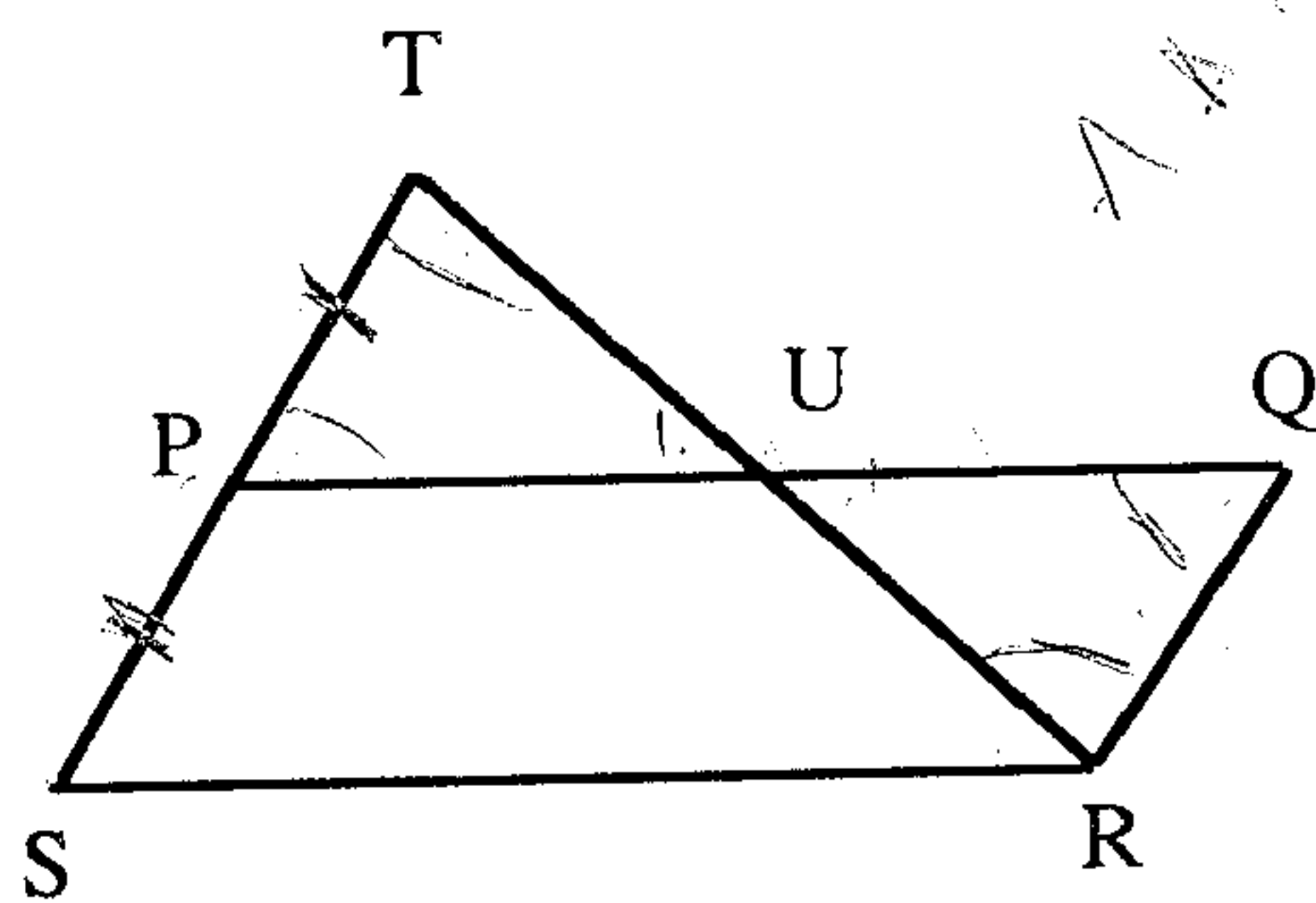
(b) Find the equation of the normal to the parabola at the point where  $x = -4$ . Write your answer in general form.(c) Find the point on the parabola at which the tangent is parallel to  $y = 3x + 1$ .

**QUESTION 5:** (12 Marks) [START A NEW PAGE]

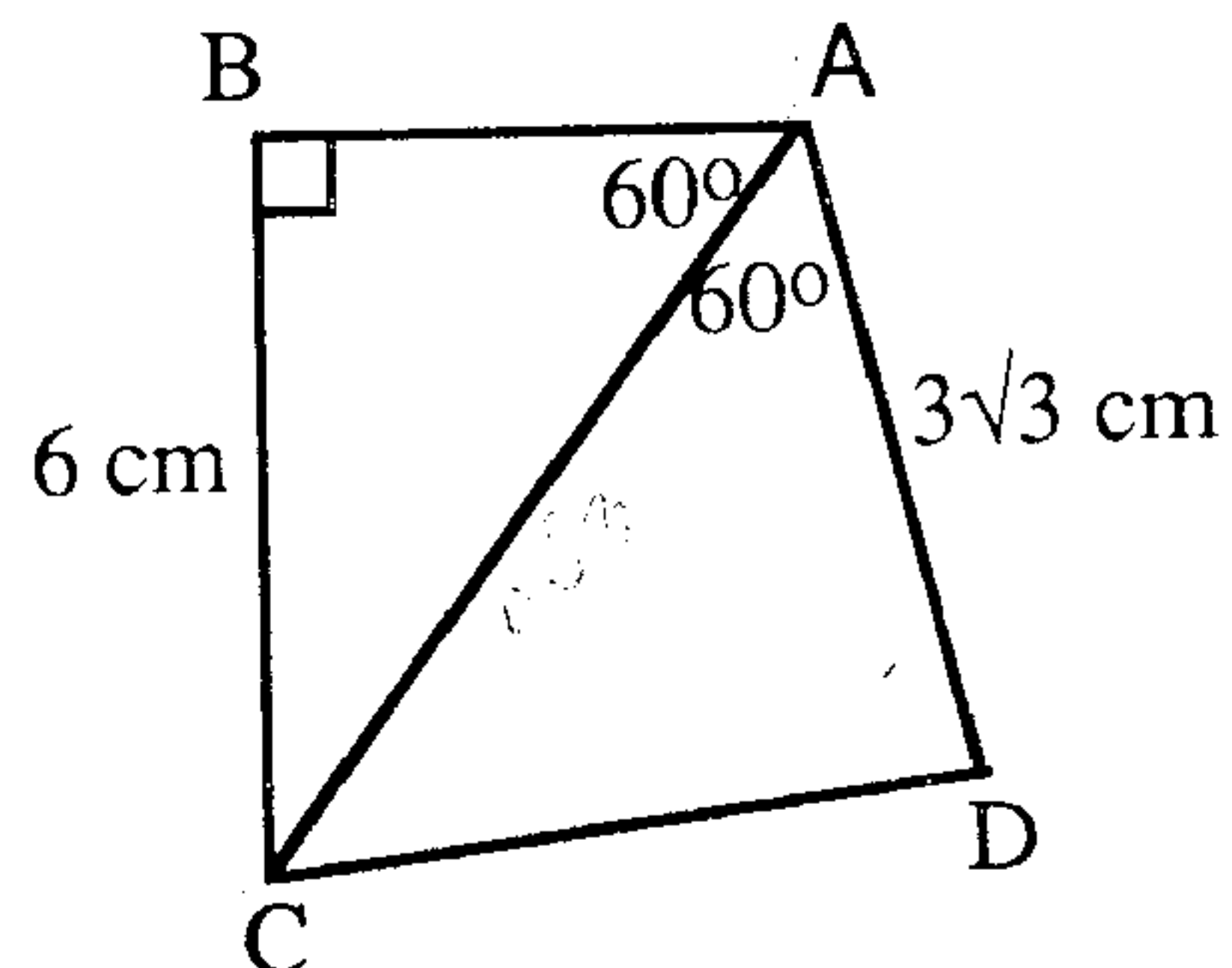
- (a)  $AC \parallel DG$ ,  $\angle ABE = 65^\circ$ ,  $BE = BF$ .  
Copy the diagram to your examination paper.  
Find the value of  $x$ , giving all reasons.



- (b) PQRS is a parallelogram and SP is extended to T so that  $SP = PT$ .  
Copy the diagram to your examination paper.  
Using congruent triangles or otherwise prove that U is the midpoint of PQ.



- (c) In the diagram, not drawn to scale,  
 $\angle BAC = \angle CAD = 60^\circ$ ,  
 $\angle ABC = 90^\circ$ ,  $BC = 6$  cm and  
 $AD = 3\sqrt{3}$  cm.



Find as exact values:

- (i) the length of AC,  
(ii) the length of CD.

**QUESTION 6:** (12 Marks) [START A NEW PAGE]

- (a) The third term of an arithmetic progression is 42 and the seventh term is 10.

- (i) Find the common difference and the first term.  
(ii) Find the sum of the first twenty terms.

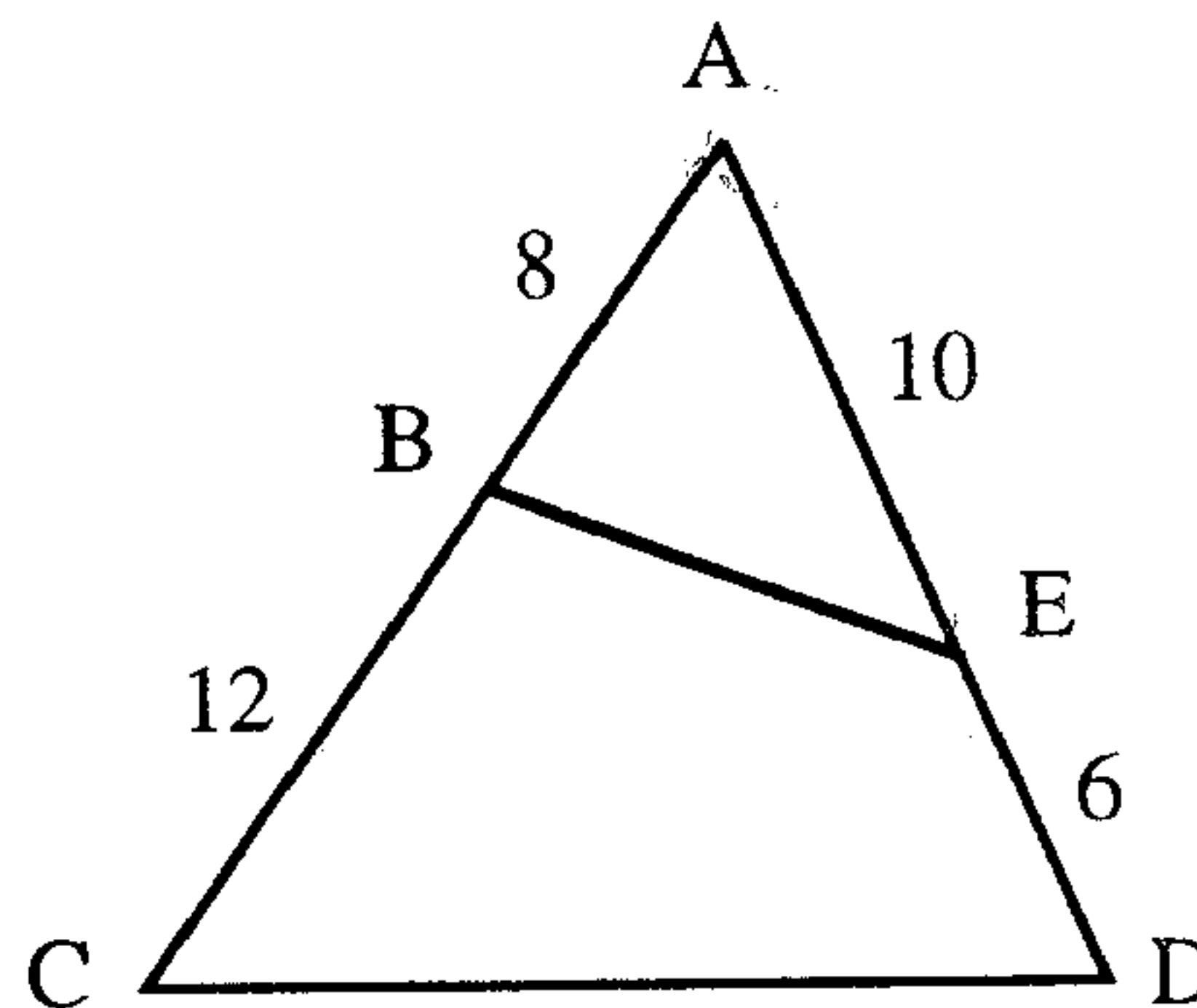
- (b) Ray deposits \$50 into a superannuation fund at the start of each month. The fund pays 15% p.a. interest which is compounded at the end of each month.

- (i) Find the value of the fund at the end of 10 years.

- (ii) How many months will Ray have to contribute to the fund if he wishes the fund to be worth \$ 25 000 ?

**QUESTION 7:** (12 Marks) [**START A NEW PAGE**]

- (a) (i) Prove that  $\triangle ABE$  and  $\triangle ACD$  are similar.
- (ii) Given that  $CD = 18$ , find the length of  $BE$ .  
Give all reasons.



- (b) A train runs between two stations stopping at each. Its velocity  $v$  km/min,  $t$  minutes after leaving the first station, is given by  $v = 0.12t(6-t)$ .

Find

- (i) the time taken to travel between the two stations.
- (ii) the maximum positive velocity attained.
- (iii) the distance between the two stations.

**QUESTION 8:** (12 Marks) [**START A NEW PAGE**]

- (a) (i) Sketch the curve  $y = 4 - x^2$ , clearly showing its intercepts with the co-ordinate axes.
- (ii) Find the volume of the solid formed when the area bounded by the curve  $y = 4 - x^2$  and the  $x$ -axis is rotated one complete revolution about the  $y$ -axis.
- (b) For the curve  $y = x^4 - 8x^3 + 18x^2 - 90$  find the co-ordinates of any stationary points and determine their nature.



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2/3 Unit. 1992

1 (a)  $x = 9$   
(b)  $\frac{2}{x(x-2)}$

(c) 1.54

(d)  $9(y-2)(y+2)$

(e)  $p = 6$

2 (a)  $BC = 3\sqrt{10}$

(b)  $m_{BC} = -\frac{1}{3}$   
 $x + 3y - 5 = 0$

(c)  $D(5, 0)$

(d)  $m_{AD} = m_{CD} = \frac{1}{2}$

$\therefore ABCD$  parm.

(e)  $\sqrt{10}$

(f)  $A = 30 \text{ u}^2$

3 (a)(i)  $6\sqrt{x}$

(ii)  $x \sec^2 x + \tan x$

(iii)  $\frac{14}{(2x+3)^2}$

(b)(i)  $\frac{1}{3} \ln 7$

(ii) 2

(c)  $y = \frac{1}{3} e^{3x} + \frac{5}{3}$

4 (a) Focal length 2

Vertex  $(4, 1)$

Focus  $(4, 3)$

(b)  $x - 2y + 22 = 0$

(c)  $(16, 19)$

5 (a)  $x = 65$

(b)  $\Delta PTU \cong \Delta BRU$  (AAS)

$PV = UR \therefore U$  mid point.

(c)(i)  $AC = 4\sqrt{3}$

(ii)  $CD = \sqrt{39}$

6 (a)(i)  $a = 58$

(ii)  $S_{20} = -360$

(b)(i)  $\$13,932.86$

(ii) 159 months.

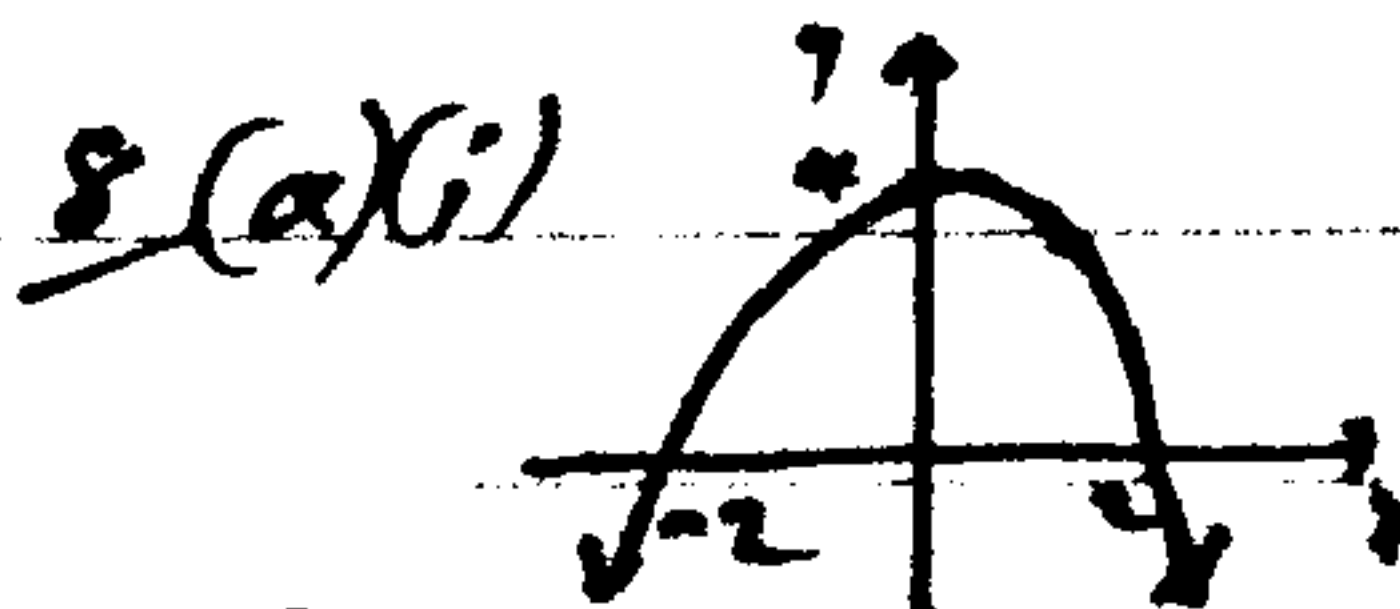
7 (a)(i)  $AC:AE = AD:AB = 2:1$   
and  $\hat{A}$  common

(ii)  $BE = 9$

(b)(i) 6 minutes.

(ii)  $v_{max} = 1.08 \text{ km/min}$

(iii) 4.32 km.



(ii)  $V = 8\pi v^2$

(b) Min T.P. at  $(0, -90)$

Horizontal point of inflection at  $(3, -63)$

9 (a)(i)  $P(66) = \frac{3}{10}$

(ii)  $P(>12h) = \frac{7}{10}$

(iii)  $P(26) = \frac{1}{3}$

(b)(i)  $t = 20$  minutes.

(ii)  $V = \frac{200}{\pi} (1 - \cos \frac{\pi t}{20})$

(iii)  $V_{max} = \frac{400}{\pi} \text{ L.}$

10 (a)  $c < -2\frac{1}{4}$

$\Rightarrow \Delta < 0$  or  $a > 0$

(b)(i)  $l = \frac{2}{r} - r$

(ii)  $V = \frac{2\pi c}{3} \sqrt{1-r^2}$

(iii) Absolute max. occurs

when  $r = \frac{1}{\sqrt{2}}$ .