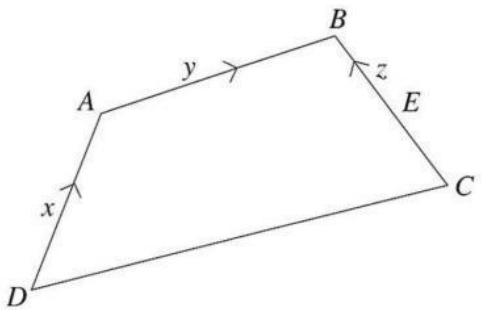
9. E is the midpoint of $\overrightarrow{BC}$. $\overrightarrow{AB} = \boldsymbol{y}$, $\overrightarrow{EB} = \boldsymbol{z}$ and $\overrightarrow{DA} = \boldsymbol{x}$.



NOT TO SCALE

Express in terms of $\boldsymbol{x}$, $\boldsymbol{y}$ and $\boldsymbol{z}$:

(a) $\overrightarrow{CB}$ [1]

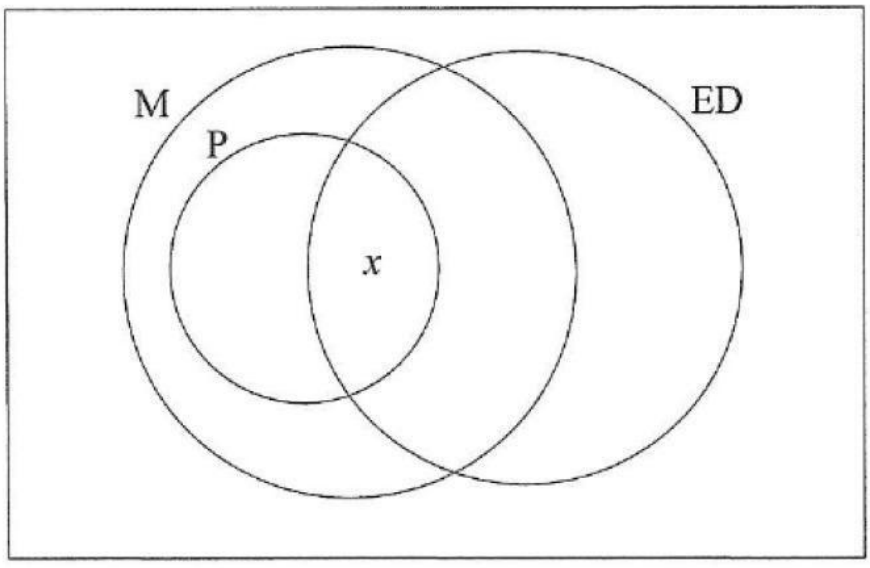
(b) $\overrightarrow{DB}$ [2]

(c) $\overrightarrow{CD}$. [2]

9. At the college this semester, there are 85 students enrolled in the Electrical Engineering Programme. The Venn diagram shows three of the courses the students may register for.

40 take Physics (P).
All Physics student take Mathematics (M).
44 take Electrical Drawing (ED).
14 take Mathematics only.
6 take Mathematics and Electrical Drawing only.
5 take none of the three.

Electrical Engineering Students

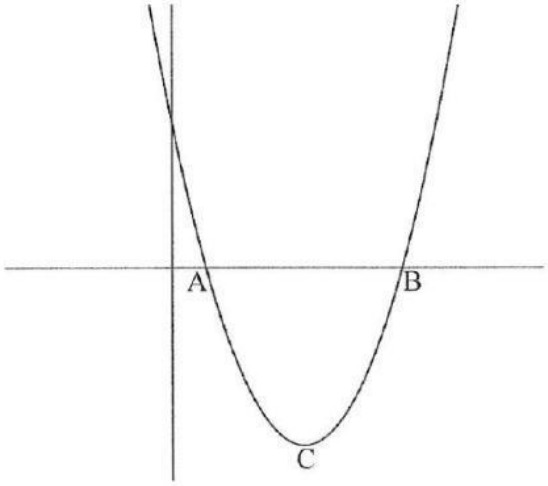


(a) Copy and complete the Venn diagram, in terms of x where applicable. [5]

(b) Write an equation in terms of x, then solve for x. [3]

LIVEWORKSHEETS

9. The diagram shows part of the graph of $y = x^2 - 6x + 4$ intersecting the x – axis at A and B with the minimum point (vertex) labelled C.



Calculate (a) the x – intercepts, giving your answer to 2 d.p. [5]

x = **or**

(b) the gradient of the tangent at C. Show working to support your answer. [3]

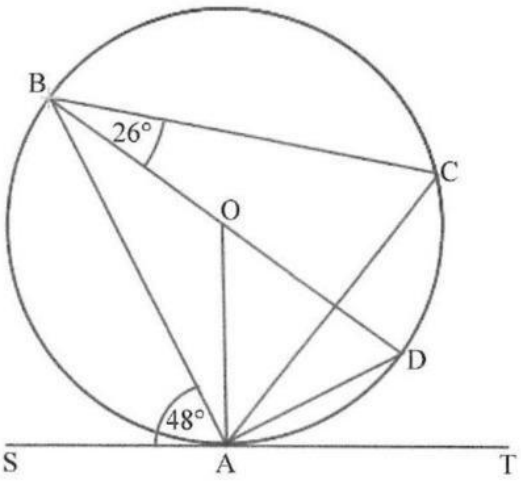
Derivative of Curve =

Coordinate at Point C =

Gradient at Point C =

9. In the diagram, which is not drawn to scale, the points A, B, C and D are on the circumference of the circle. O is the centre of the circle and ST is the tangent to the circle at the point A.

BD is a diameter, $\angle SAB = 48°$ and $\angle CBD = 26°$.



NOT TO SCALE

Find:

(a) $\angle ACB$ [1]

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(b) $\angle AOB$ [1]

(c) $\angle CAD$ [1]

(d) $\angle DAT$ [1]

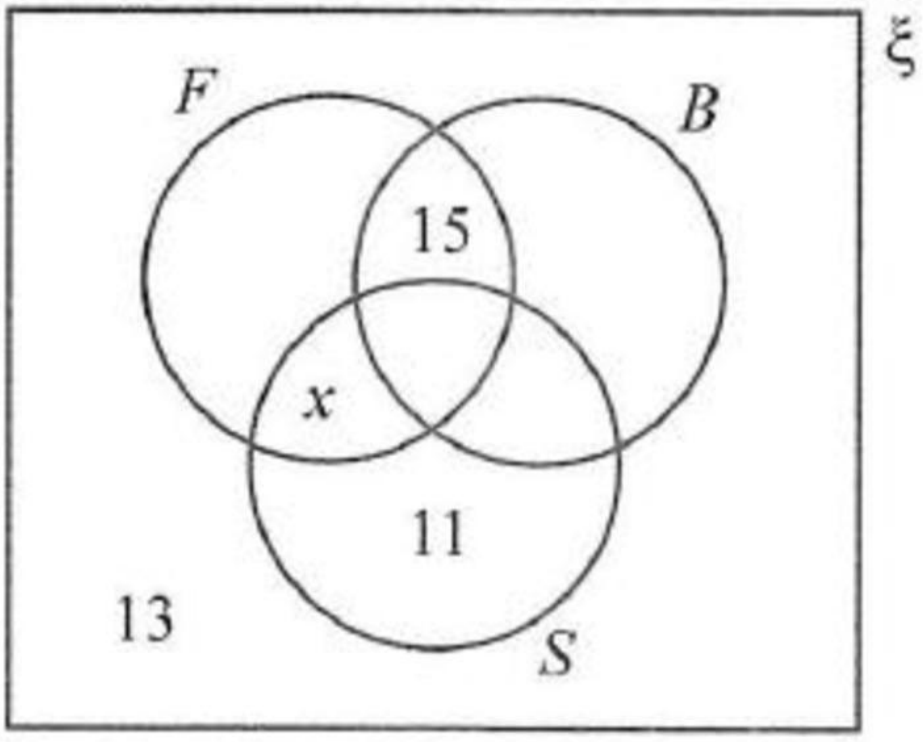
(e) $\angle OAD$ [1]

9. A group of 110 students of Grade 12 were asked which sports they played. The results are below.

F = { students who play football }
B = { students who play basketball }
S = { students who play softball }

14 students play football only.
11 students play softball only.
15 students play football and basketball only.
21 students play all three sports.
13 students play none of these sports.
x students play football and softball only.
$2x$ students play basketball and softball only.
$3x$ students play basketball only.

(a) Copy and complete the Venn diagram using the above information. [4]



(b) Form an equation and solve it to find the value of x. [2]

(c) Find

(i) the number of students who play basketball, [1]

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(ii) $n(B \cap S)$, [1]

(iii) $n(F')$, [1]

(iv) $n[S' \cap (F \cup B)]$. [1]

9. Express as a single fraction in lowest terms:

(a) $\dfrac{6x}{(x+3)(x-3)} - \dfrac{3}{x-3}\,\dfrac{(\quad)}{(\quad)}$ [4]

Fraction after Factorizing

$$\frac{6x - 3(\quad)}{(\quad)(\quad)}$$

Fraction after Simplifying

$$\frac{6x - 3(\quad)}{(\quad)(\quad)}$$

(b) $\dfrac{x^2-16}{x+4} \times \dfrac{4xy}{3xy-12y}$ [4]

Fractions after Factorizing

$$\frac{(\quad)(\quad)}{} \times \frac{}{(\quad)}$$

Expression after Simplifying =

9. Given the curve with equation $y = 3x^2 - 4x + 1$ and the point $P(2, 5)$ on the curve, find

(a) the gradient of the curve at P, [2]

(b) the equation of the tangent to the curve at P. [3]

y = **x**

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