



Randwick Boys' High School

Mathematics Department Two Unit Mathematics Component B Assessment Task Year Twelve

March 1999

Candidates may attempt all questions.
Begin each question on a NEW page.
All necessary working should be shown in every question.
Full marks may not be awarded for careless or badly arranged work.

Time allowed : 45 minutes.

EXAMINER : Mr G. Evans

Name: _____

Teacher's Name: _____

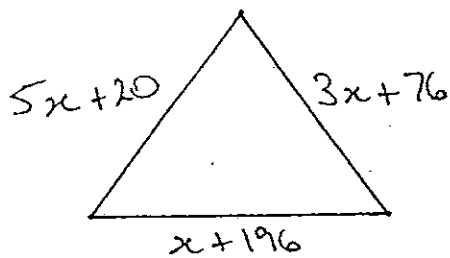
THIS IS AN ASSESSMENT TASK.

YEAR 12
2 UNIT ASSESSMENT TASK
Component B - March 1999

1 (3 marks)

Given that the triangle below is isosceles, determine:

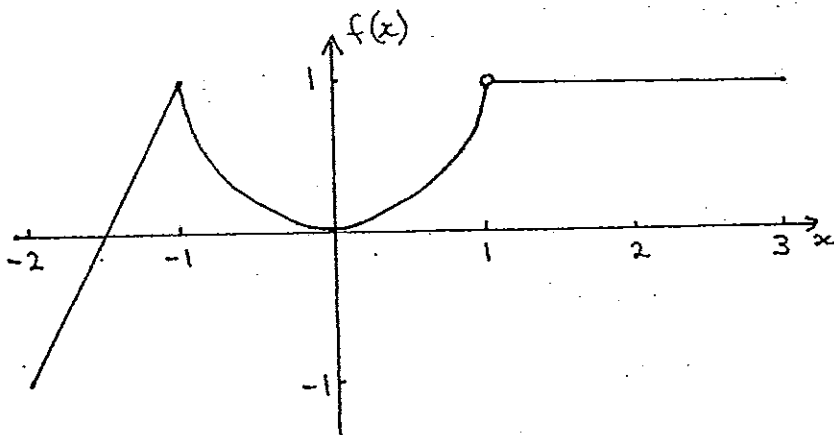
- (a) the value of x that will give a maximum perimeter.
(b) the maximum perimeter.



N.B. Triangle is not drawn to scale.

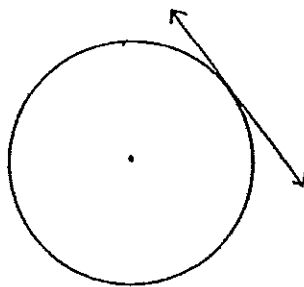
2 (7 marks)

- (a) Define a function, $f(x)$ in the domain $-2 \leq x \leq 3$, that describes the graph sketched below.



- (b) Give the range of the function.

3 (4 marks)



Explain two methods that could be used to determine whether or not the line is a tangent to the circle.

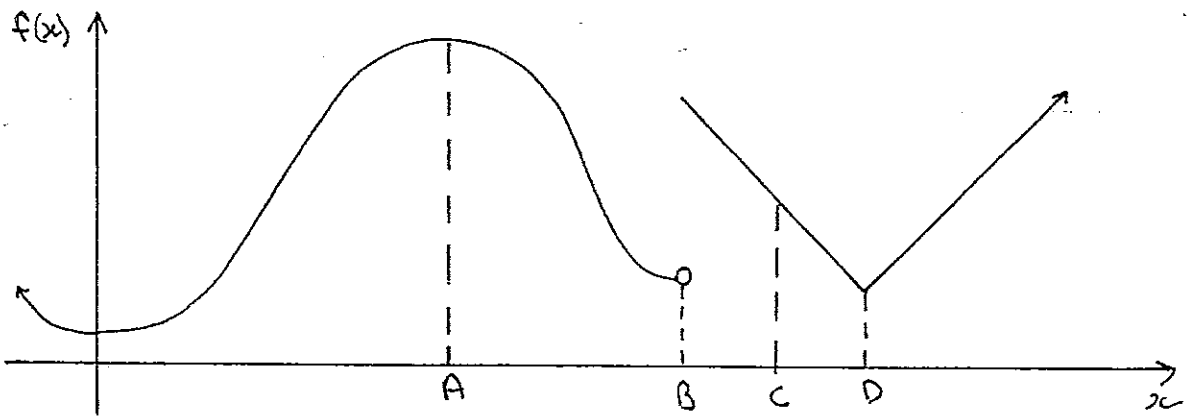
State the name of any formulae to be used and briefly describe how it would solve the problem.

NOTE: Do NOT do the actual proof.

4 . For the curve below, determine at each point A, B, C and D whether the function is:

(8 marks)

- (i) continuous or discontinuous; and
 (ii) differentiable or not differentiable.



5 (3 marks)

A solution to the question:

"Differentiate $f(x) = \frac{2x+1}{4x-3}$, $x \neq \frac{3}{4}$ "

is given below. Read it carefully, it contains mistakes.

Line

1 $f(x) = \frac{2x+1}{4x-3}$

2
$$f'(x) = \frac{(4x-3) \frac{d}{dx}(2x+1) + (2x+1) \frac{d}{dx}(4x-3)}{(2x+1)^2}$$

3
$$f'(x) = \frac{(4x-3) \times 2 + (2x+1) \times 4}{(2x+1)^2}$$

4
$$f'(x) = \frac{8x-3+8x+1}{(2x+1)^2}$$

5
$$f'(x) = \frac{16x-2}{(2x+1)^2}$$

For each mistake, give the line number and state what the mistake is.

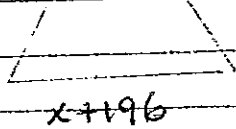


Name: S. Ann

Teacher: 30X

Class: 2

$5x+20$ $3x+76$ a) $P = 5x+20 + 3x+76 + 196+x$
 $P = 9x + 292$



* isosceles sides unknown

i) $5x+20 = 3x+76$ $5x+20 = x+196$ $x+196 = 3x+76$
 $2x = 96$ $4x = 176$ $120 = 2x$
 $x = 28$ $x = 44$ $x = 60$

\therefore largest x value is 60

$\therefore P = 9x + 292$ (from above)

$$P = 60 \times 9 + 292$$

$$= 832 \quad (\text{maximum perimeter})$$



Name: DCum

Teacher: 301

Class: 12M2

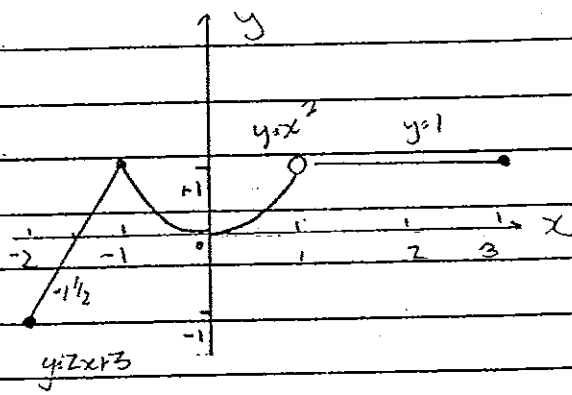
2

$$a) \quad y = \begin{cases} 2x+3 & \text{for } -2 \leq x \leq -1 \\ x^2 & \text{for } -1 \leq x < 1 \\ 1 & \text{for } 1 < x \leq 3 \end{cases}$$

b) range (for $-2 \leq x \leq 3$)

$$R: -1 \leq y \leq 1$$

7



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

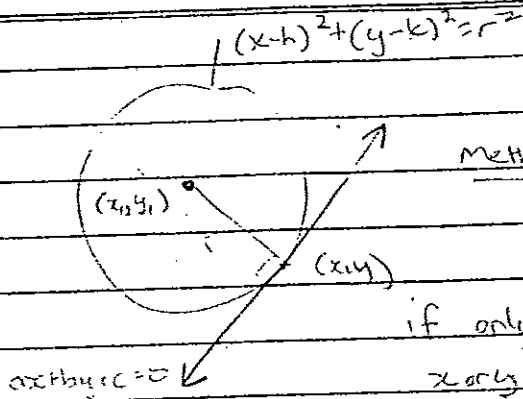


3

Name: Dan

Teacher: Box

Class: 12M2



Determining Tangent

Method 1: Simultaneous Equations

$$\text{i.e. } \begin{cases} (x-h)^2 + (y-k)^2 = r^2 \\ ax + by + c = 0 \end{cases}$$

if only 1 solution can be obtained for x or y , then the tangent meets the circle once only.

Method 2: Perpendicular Formula

① Use the perpendicular formula $\Rightarrow \frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$
where (x_1, y_1) is centre of circle.

to find perpendicular distance \Rightarrow to $ax + by + c = 0$

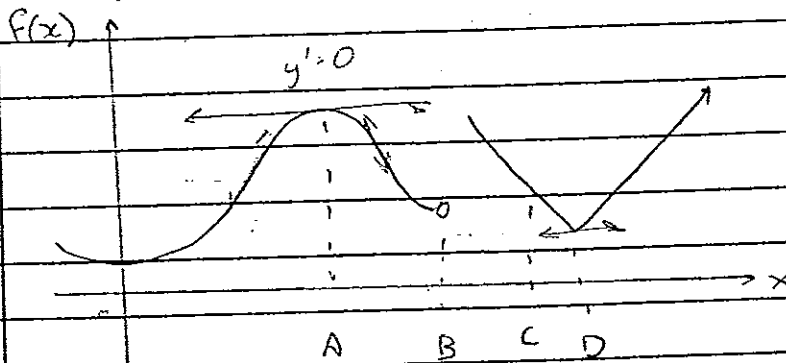
② If perpendicular distance equals the radius of the circle, (r) from $(x-h)^2 + (y-k)^2 = r^2$ it is a tangent



8/8

Name: DGM
 Teacher: BOX
 Class: 12M2

4



- 1) A, C & D are continuous ✓
- B is discontinuous ✓
(cross at B)
- A is differentiable ✓
(stationary point & changes gradient) ✓
= 0
- B is not differentiable ✓
(discontinuous point)
- C is differentiable ✓
(not a uniform gradient at point)
- D is not differentiable ✓
= 0 & linear

$y = x^2$

$y = 2x$
 $(0, 0)$

$f(0) = 0$ $f'(0) = 2$ *non-linear*

$y = x^2$

$y = 2x^2$

$f'(0) = 0$

$y = |x|$
 $y = -x$ $y = x$
 $y' = -1$ OR 1



$\frac{2}{3}$

Name: D Cam

Teacher: BOX

Class: 12M2

5

Differentiate $y = \frac{2x+1}{4x-3} \sqrt{x + \frac{3}{4}}$

$y' = \frac{vu' - uv'}{v^2} \therefore y' = \frac{(2x+1) \frac{d}{dx}(4x-3) - (4x-3) \frac{d}{dx}(2x+1)}{(2x+1)^2}$

Line 2 has mistakes: - The wrong factor is being differentiated in the wrong order

$(4x-3) \frac{d}{dx}(2x+1) + (2x+1) \frac{d}{dx}(4x-3)$
switched switched

it should read $(2x+1) \frac{d}{dx}(4x-3) - (4x-3) \frac{d}{dx}(2x+1)$

- The operations sign in the numerator should be a MINUS not plus

Line 4 has mistakes for $f'(x) = \frac{8x-3+8x+1}{(2x+1)^2}$

- Multiplication from line 3 incorrect in numerator

$(4x-3) \times 2 + (2x+1) \times 4$
Correct ONE IS $8x-6 + 8x+4$