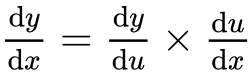
# Worksheet in Calculus , Grade 12,Math AA SL,MS

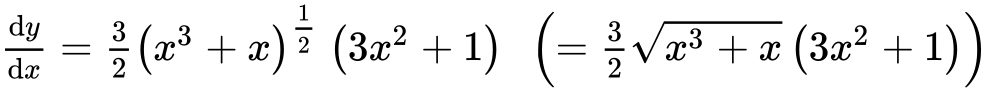
**1a.** *[3 marks]*

## Markscheme

\* This question is from an exam for a previous syllabus, and may contain minor differences in marking or structure.

evidence of choosing chain rule       ***(M1)***

*eg*   ,  ,  

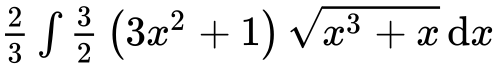
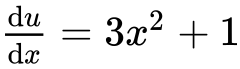
        ***A2  N3***

***[3 marks]***

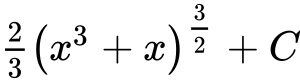
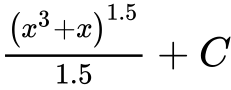
**1b.** *[3 marks]*

## Markscheme

integrating by inspection from (a) or by substitution       ***(M1)***

eg   ,  , , ,  

correct integrated expression in terms of        ***A2 N3***

*eg*   ,  

***[3 marks]***

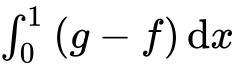
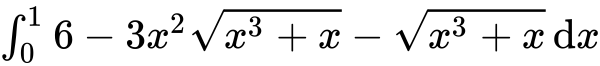
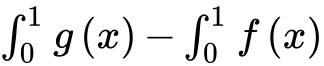
**1c.** *[2 marks]*

## Markscheme

integrating and subtracting functions (in any order)        ***(M1)***

*eg*   ,  

correct integral (including limits, accept absence of )       ***A1 N2***

*eg*   ,  ,  

***[2 marks]***

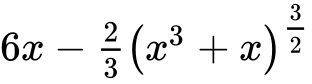
**1d.** *[6 marks]*

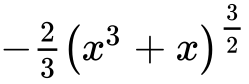
## Markscheme

recognizing  is a common factor (seen anywhere, may be seen in part (c))       ***(M1)***

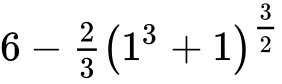
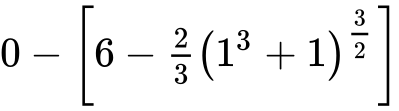
*eg*   ,  ,   

correct integration      ***(A1)(A1)***

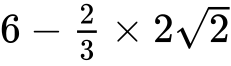
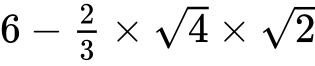
eg   

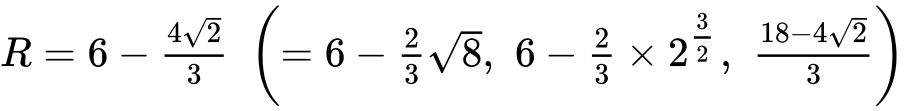
**Note:** Award ***A1***for  and award ***A1***for .

substituting limits into **their** integrated function and subtracting (in any order)       ***(M1)***

*eg*   ,  

correct working      ***(A1)***

*eg*   ,  

area of        ***A1  N3***

***[6 marks]***

**2a.** *[2 marks]*

## Markscheme

2(8 × 4 + 3 × 4 + 3 × 8)        ***M1***

= 136 (cm2)        ***A1***

***[2 marks]***

**2b.** *[2 marks]*

## Markscheme

        ***M1***

(AG =) 9.43 (cm) (9.4339…, )        ***A1***

***[2 marks]***

**2c.** *[3 marks]*

## Markscheme

       ***M1***

        ***A1***

110 000 (boxes)        ***A1***

***[3 marks]***

**2d.** *[5 marks]*

## Markscheme

      ***M1***

**Note:** Award ***M1***for evidence of integration.

       ***A1A1***

**Note:** Award ***A1***for either  or  award ***A1***for both correct terms and constant of integration.

       ***M1***



      ***A1***

***[5 marks]***

**2e.** *[3 marks]*

## Markscheme

     ***M1***

       ***A1***

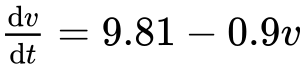
11 006 (boxes)      ***A1***

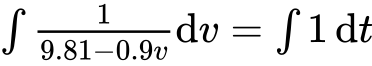
**Note:** Award ***M1*** for their , award ***A1***for their correct solution to .  
Award the final ***A1***for expressing their solution to the minimum number of boxes. Do not accept 11 005, the nearest integer, nor 11 000, the answer expressed to 3 significant figures, as these will not satisfy the demand of the question.

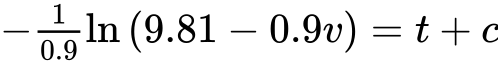
***[3 marks]***

**3a.** *[7 marks]*

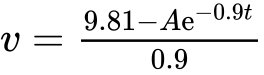
## Markscheme

        ***M1***

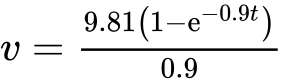
        ***M1***

      ***A1***

      ***A1***

      ***A1***

when ,  hence       ***A1***

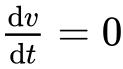


      ***A1***

***[7 marks]***

**3b.** *[2 marks]*

## Markscheme

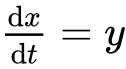
**either** let  tend to infinity, or         ***(M1)***

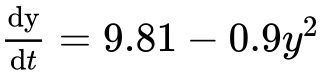
      ***A1***

***[2 marks]***

**3c.** *[2 marks]*

## Markscheme

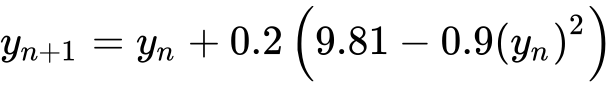
       ***M1***

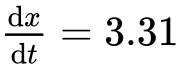
     ***A1***

***[2 marks]***

**3d.** *[4 marks]*

## Markscheme

,        ***(M1)(A1)***

,        ***(M1)A1***

***[4 marks]***

**3e.** *[1 mark]*

## Markscheme

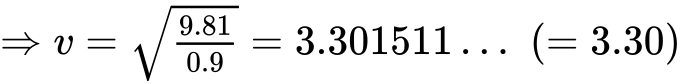
3.3015      ***A1***

***[1 mark]***

**3f.** *[2 marks]*

## Markscheme

     ***M1***

     ***A1***

***[2 marks]***

**3g.** *[2 marks]*

## Markscheme

the model found the terminal velocity very accurately, so good approximation        ***R1***

intermediate values had object exceeding terminal velocity so not good approximation        ***R1***

***[2 marks]***

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