# SEMESTER ONE
# YEAR 12
# MATHEMATICS METHODS
# REVISION 1
# Unit 3

# 2016

## Section One
## (Calculator–free)

**Name:** _____

**Teacher:** _____

## TIME ALLOWED FOR THIS SECTION

Reading time before commencing work:       5 minutes
Working time for section:       50 minutes

## MATERIAL REQUIRED / RECOMMENDED FOR THIS SECTION

### To be provided by the candidate
Standard items*:* pens, pencils, pencil sharpener, highlighter, eraser, ruler.

## IMPORTANT NOTE TO CANDIDATES

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non–personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

### To be provided by the supervisor

Question/answer booklet for Section One.
A formula sheet which may also be used for Section Two.

**Structure of this examination**

| | Number of questions available | Number of questions to be answered | Working time (minutes) | Marks available | Percentage of exam |
|---|---|---|---|---|---|
| **Section One Calculator—free** | **7** | **7** | **50** | **50** | **35** |
| Section Two Calculator—assumed | 13 | 13 | 100 | 100 | 65 |
| | | | Total marks | 150 | 100 |

**Instructions to candidates**

1.   The rules for the conduct of this examination are detailed in the Information Handbook. Sitting this examination implies that you agree to abide by these rules.

2.   Write your answers in the Question/Answer booklet.

3.   You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question.

4.   Spare pages are provided at the end of this booklet.  If you need to use them, indicate in the original answer space where the answer is continued i.e. give the page number.

5.   Show all your working clearly. Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat an answer to any question, ensure that you cancel the answer you do not wish to have marked.

6.   It is recommended that you **do not use pencil**, except in diagrams.

7.   The Formula Sheet is **not** to be handed in with your Question/Answer booklet.

1.    (7 marks)

Find $\dfrac{dy}{dx}$ for each of the following

(a)    $y = x^2(2x - 1)$.                                                                                    (2)

(b)    $y = \dfrac{sin(2x)}{2x}$.                                                                          (3)
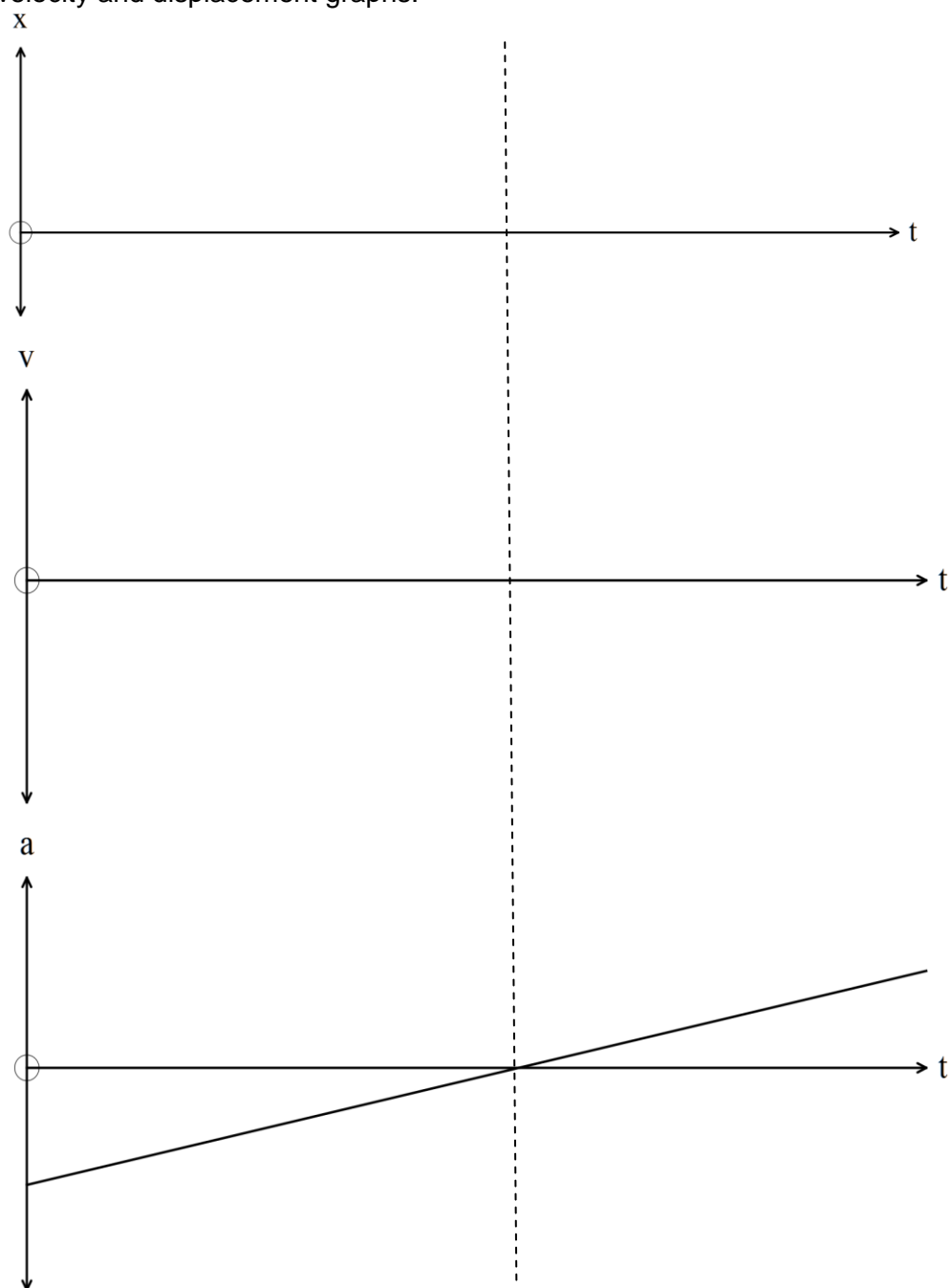
(c)    $y = \left(x + e^x\right)^4$.                                                                       (2)

2.    (9 marks)

   (a)    The acceleration function of a particle is graphed below Use it to graph the
          velocity and displacement graphs.                                    (4)

x



v



a

(b)    What type of function does is the displacement graph represent?          (1)

(c)    Explain how $a(t)=0$ on the acceleration graph relates to the displacement
       graph.                                                                   (1)

(d)    Explain how $a(t)=0$ on the acceleration graph relates to the velocity graph.   (1)

(e)    Explain how $v(t)=0$ on the velocity graph relates to the displacement
       graph.                                                                   (2)

3.    (6 marks)

    (a)    Find the following

        (i)     $\int \sqrt{2x+1}\, dx$                                                                    (2)

        (ii)    $\int 1 + x - e^{-x}\, dx$                                                              (2)

    (b)    Given $\dfrac{dy}{dx} = 2x + 3x^2 - x^{\frac{1}{2}}$ find the function $y = f(x)$ given the point $(1,4)$
           belongs to the function.                                                          (2)

4.    (7 marks)

Evaluate the following

(a)    $\int_2^4 \left(x^2 - 2x + 3\right) dx$                    (3)
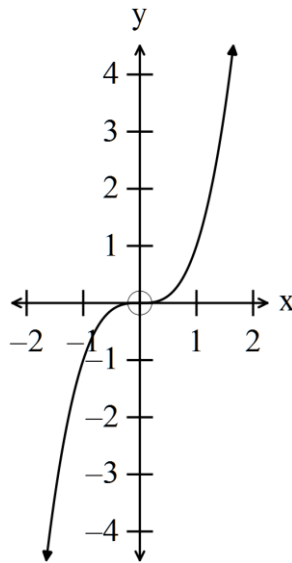
(b)    $\int_{\pi/2}^{\pi} \left(sin(x) - cos(x)\right) dx$                    (2)

(c)    $\int_0^1 \sqrt{e^x}\, dx$                    (2)

5.    (5 marks)

Consider the graph of $f(x) = x^3$.



(a)   Complete the following.

(i)    $\int_{-2}^{2}(x^3)\,dx$                                                                                (1)

(ii)   $\int_{0}^{2}(x^3)\,dx$                                                                                 (1)

(iii)  Evaluate the area between the function, the x axis and the bounds
       $x = -2$ and $x = 2$.                                                                  (1)

(b)    True or false? Give your reasons.

(i)    $2\int_0^2 x^2 dx = \int_{-2}^2 x^2 dx$                                                                (1)

(ii)    $\int_0^1 x^3 dx = \int_1^2 x^3 dx$                                                                (1)

6.    (8 marks)

(a)    If  $F(x) = x^3 - x^2$

   (i)     find  $F'(x)$.                                                          (1)

   (ii)    hence sImplify  $\int_0^p F'(x)\,dx$                                      (2)

(b)    Given  $F(x) = \int_1^x t^3\,dt$  find an expression for  $F'(x)$.         (2)

(c)    Find  $\dfrac{d}{dx}\left( \int_1^{3x} \cos 2y\,dy \right)$.               (3)

7.    (8 marks)

Given $f(x)=e^x$, $g(x)=\cos(x)$ and $h(x)=-x$

(a)    (i)    find $y=h(g(x))$.                                                                    (1)

       (ii)    show $\dfrac{d}{dx}\left(h(g(x))\right)=g\left(\dfrac{\pi}{2}-x\right)$                    (2)

(b)    (i)    find $y=f(h(x))$.                                                                     (1)

       (ii)    hence find the expression for $\dfrac{d}{dx}\left(f(h(x))\right)$.            (2)

(c)    find $g(f(0))$.                                                                              (2)

**END OF SECTION ONE**