**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**IB Mathematics SL Year 2**

**21/22AD TAKEHOME SSA**

**DUE WEDNESDAY DECEMBER 5th**

**Calculator Section**

**40 Points**

**1.** Consider functions of the form *y* = e*–kx*

(a) Show that  =  (1 – e–*k*).

(3)

(b) Let *k =* 0.5

(i) Sketch the graph of *y* = e–0.5*x*, for –1  *x*  3, indicating the coordinates of the
*y*-intercept.

(ii) Shade the region enclosed by this graph, the *x*-axis, *y-*axis and the line *x* = 1.

(iii) Find the area of this region.

(iv) Imagine this area is rotated 360 degrees about the x-axis. Determine the volume of this figure.

(8)

 (Total 8 marks)

**2.** The diagram shows part of the curve *y* = sin *x*. The shaded region is bounded by the curve and the lines *y* = 0 and *x* =



 a.) Given that  and calculate the **exact** area of the shaded region.

|  |  |
| --- | --- |
| *Working:* |  |
|  | *Answer*:...................................................................... |

(Total 6 marks)

b.) Imagine the shape above is rotated 360 degrees about the y-axis. Determine the volume of this figure.

 (3)

**3.** The following diagram shows the graphs of *f* (*x*) = ln (3*x* – 2) + 1 and *g* (*x*) = – 4 cos (0.5*x*) + 2, for 1  *x*  10.



(a) Let *A* be the area of the region **enclosed** by the curves of *f* and *g*.

(i) Find an expression for *A*.

(ii) Calculate the value of *A*.

(iii) Imagine the area enclosed is rotated 360 degrees about the y-axis. Determine the volume of this figure.

 (Total 9 marks)

**4.** Find

(a) 

(b) .

|  |  |
| --- | --- |
| *Working:* |  |
|  | *Answers*:(a) ..................................................................(b) .................................................................. |

(Total 4 marks)

**5.** The diagram shows part of the graph of *y* = 12*x*2(1 – *x*).



(a) Write down an integral which represents the area of the shaded region.

(b) Find the area of the shaded region.

(c) Determine the volume if the region is rotated 360 degrees about the line y=0

|  |  |
| --- | --- |
| *Working:* |  |
|  | *Answers*:(a) ..................................................................(b) ..................................................................(c) ………………………………………….. |

(Total 7marks)