SCOTCH COLLEGE

12 Mathematics Methods 2023

Test 2 – Integration and Applications

Section 2: Calculator-Assumed

Time allowed: 25 minutes **Maximum marks: 25**

Name:_____ **Teacher:** Foster | Kelly

Instructions:

- Show all working clearly.
- Sufficient detail must be shown for marks to be awarded for reasoning.
- A formula sheet will be provided.
- Calculators and 1 A4 page (2 sides) of personal notes are permitted.

Question 5 [7 marks]

The velocity in metres per second of an object that travels on a straight line is given by;

$$v(t) = \frac{8t(t^2-6t+4)}{3} \text{ for } 0 \leq t \leq 5$$

Calculate the:

a) time(s) that the object is at rest **[2]**

b) acceleration of the object at $t = 3$ **[1]**

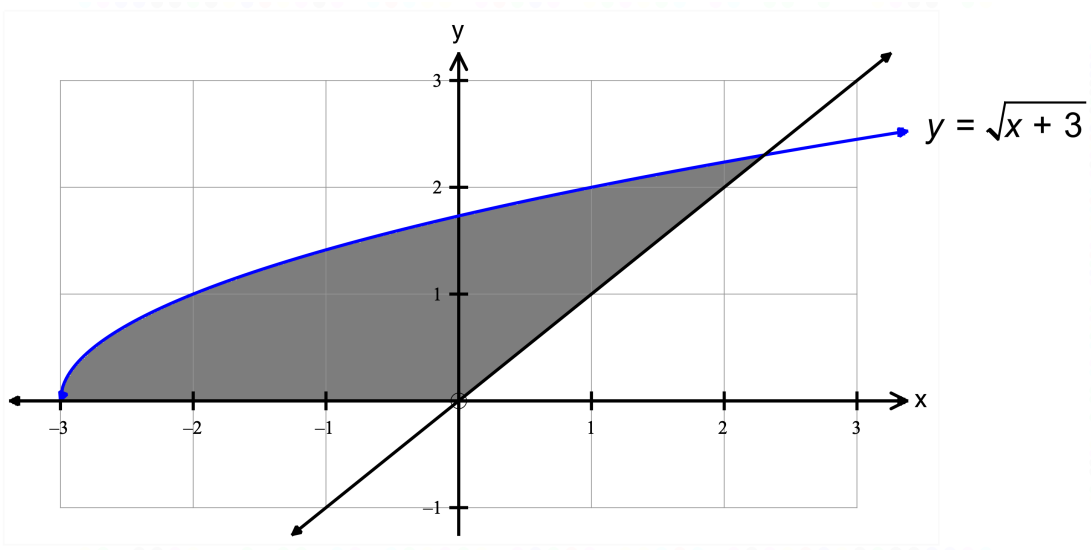
c) change in displacement of the object during the third second **[2]**

d) total distance travelled by the object **[2]**

Question 6 [3 marks]

Show the use of integral(s) to determine the shaded area below.

Give your answer to two decimal places.



Question 7 [5 marks]

The birth rate, in thousands, for a population of insects observed over a 10-year period from the start of 2010 is given by:

$$b(t) = 8 + 3t, 0 \leq t \leq 10$$

a) At what rate is the population of insects changing at 5 years? **[1]**

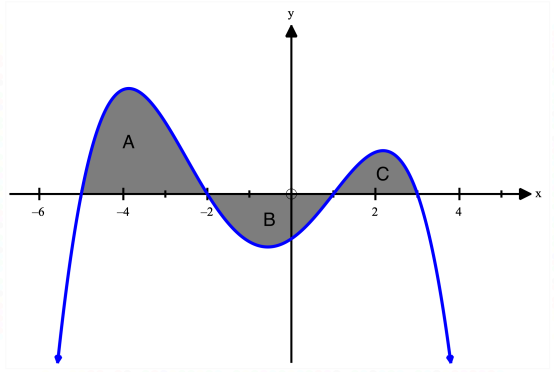
b) How many insects are born over the 10-year period modelled by the function $b(t)$? **[2]**

c) At what time does the total number of insects born reach 50 000?

Give your answer to the nearest month. **[2]**

Question 8 [6 marks]

The graph of $y = f(x)$ as well as the area of each region enclosed by the curve and the x - axis is shown in the table below.



Region	A	B	C
Area of region	12	15	7

a) Determine the area enclosed between the graph of $y = f(x)$ and the x - axis, from $x = -5$ to $x = 3$. **[1]**

b) Determine the value of:

$\int_{-2}^{3} f(x)\,dx$ **[1]**

ii) $\int_{-2}^{-5} \frac{f(x)}{4}\,dx$ **[2]**

i) $\int_{-5}^{1} 3 + f(x)\,dx$ **[2]**

Question 9 [4 marks]

The area enclosed by the lines $y = ax$, $y = 6 - x$ and the positive y - axis is k units² where a is greater than zero.

By first writing an integral, determine the value of a terms of k.

-----END OF SECTION 2-----