ST IGNATIUS COLLEGE RIVERVIEW

ASSESSMENT TASK NUMBER 3

YEAR 12

2003

MATHEMATICS (2 Unit)

Time allowed: 50 minutes

Instructions to Candidates

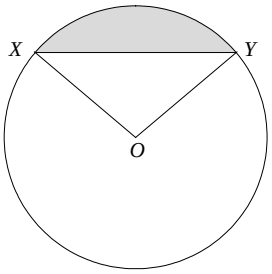
- Attempt **all** questions

Question	Topics	Marks
1	Trigonometric Functions (part 1)	8
2	Trigonometric Functions (part 2)	8
3	Applications of Calculus to the Physical World (part 1)	8
4	Applications of Calculus to the Physical World (part 2)	8

- Show all necessary working. Marks may be deducted for missing or poorly arranged work.
- Board approved calculators may be used.
- Each question attempted must be returned in a ***separate*** answer sheet clearly marked Q 1, Q 2 etc
- **Each answer sheet must have your name and the name of your mathematics teacher.**

Question 1 Start a new page Marks

a



(Figure not to scale)

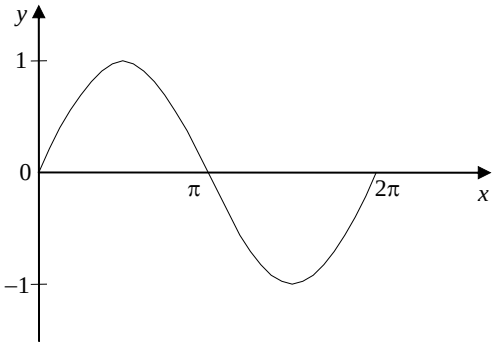
(*O* is the centre of the circle)

i The size of $\angle XOY = \frac{5\pi}{9}$ radians. Write down the size of $\angle XOY$ in degrees. 1

ii Find the exact length of the minor arc *XY* if *OX* = *OY* =10 cm. 1

iii Find the area of the shaded region correct to the nearest cm^2. 2

b The diagram shows the graph of $y = \sin x$ for $0 \le x \le 2\pi$.
Copy this diagram neatly onto your answer sheet. 0



NOT TO SCALE

i On the same co-ordinate axes, sketch the graph of $y = \cos 2x$ for $0 \le x \le 2\pi$. 1

ii Use your diagram to state the **number** of solutions in $0 \le x \le 2\pi$ to the equation $\sin x = \cos 2x$ 1

c Draw a neat sketch of $f(x) = 2\cos(x) + 1$ for $0 \le x \le 2\pi$ 2

Question 2 Start a new answer booklet Marks

a Differentiate with respect to x:

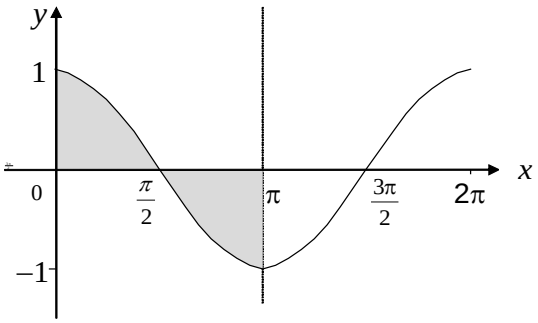
i $\tan\frac{x}{3}$. 1

ii $(1 + \sin x)^3$. 2

b Evaluate $\int_0^{\frac{\pi}{8}} \sec^2 2x \ dx$. 2

c Show that $\int_0^{\pi} \cos x \ dx = 0$. 1

d i The graph of $y = \cos x$, for $0 \le x \le 2\pi$ is shown below. 0



ii On the diagram the regions bounded by the curve y = cos x, the x axis, and the lines $x = 0$ and $x = \pi$ have been shaded. 2

Calculate the total area of these shaded regions.

Question 3 Start a new answer page Marks

a A particle moves in a straight line such that its displacement, x cm, after t seconds is given by: $x = t^3 - 6t^2 + 9t + 4$.

i Where is the particle initially? 1

ii What is the average speed of the particle in the first second? 2

iii When does the particle first change direction? 2

b A particle moving with a constant acceleration of 4 ms^{-2} starts from rest. Find:

i the time taken for the particle to attain a velocity of 22 ms^{-1}; 1

ii the distance travelled by the particle in this time. 2

Question 4 Start a new answer page Marks

a The diameter of a tree (D cm), t years after the start of a particular growth period is given by $D = 60e^{kt}$.

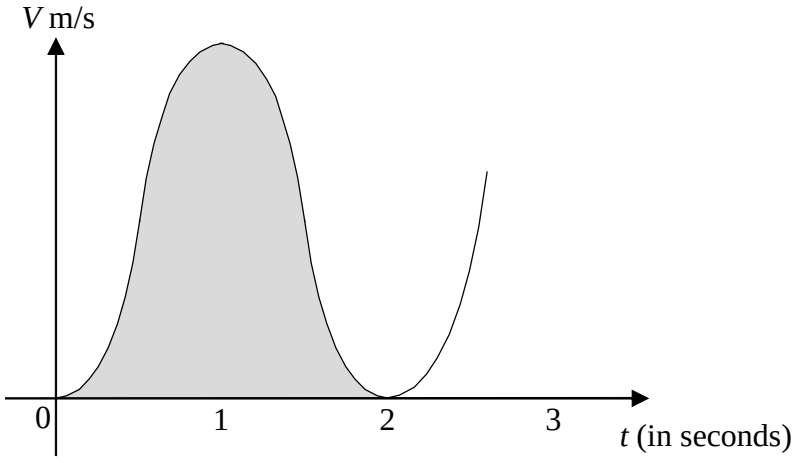
i Show that $\frac{dD}{dt} = kD$ where k is a constant. 1

ii If k = 0.15, how long will it take for the diameter of the tree to measure 64 cm? (Answer to the nearest number of days.) 3

b A pool is being drained and the number of litres of water, L, in the pool at time t minutes is given by the equation: $L = 120(40 - t)^2$.

At what rate is the water draining out of the pool when t = 6 minutes? 2

c 2



The velocity-time graph of a particle starting from rest at the origin is shown in the diagram.

Copy this diagram onto your answer sheet. On this copied diagram, change the vertical axis to x and sketch the displacement-time graph of the particle.