91579 READINESS CHECK

Complete the nine questions on the next three pages as a 'warm up' before attempting the four practice achievement standards which start on page 7.

QUESTION ONE

Find the integrals. Remember any arbitrary constants.

(a) $\int (6x^3 - \frac{3}{x^2})\ dx$

(b) $\int (2x + \frac{2}{\sqrt{x}})\ dx$

(c) $\int 4(3x+2)^3\ dx$

(d) $\int 2e^{5x-1}\ dx$

(e) $\int \sqrt[4]{8x-1}\ dx$

(f) $\int \frac{6}{2x+3}\ dx$

(g) $\int 3\sin 2x\ dx$

(h) $\int -\operatorname{cosec} 6x \cot 6x\ dx$

(i) $\int \frac{9x+2}{x}\ dx$

QUESTION TWO

An object moves in a straight line so that after t seconds, its acceleration in ms^{-2} is given as $a = 8 \sin 2t$. If the velocity of the object after $\frac{\pi}{2}$ seconds is 7 ms^{-1}, find its distance s, from its initial position at that moment.

QUESTION THREE

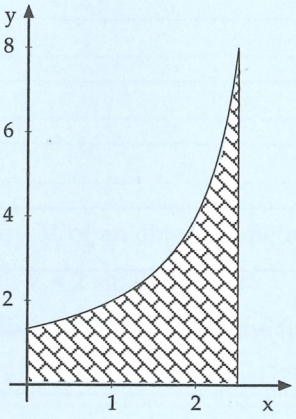
Solve the differential equation $\frac{dy}{dx} = \frac{2x}{e^y}$ given that $y = 0$ when $x = 2$.

QUESTION FOUR

A backyard has a lawn and a paved area. The paved area can be modelled by the shaded area on the graph below.

The shaded area is bounded by $y = \frac{4}{3-x}$, $x = 0$ and $x = 2.5$.

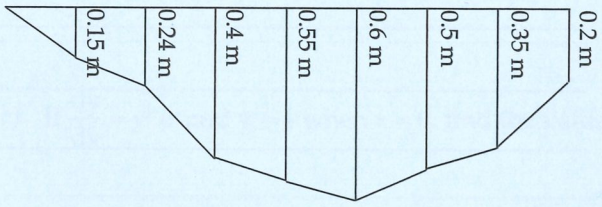
Calculate the area of the paving.



QUESTION FIVE

The cross sectional area of a stream is found by finding the depths at equal intervals from one bank to another. The stream is 4 metres wide.

Use the Trapezium Rule to calculate the cross-sectional area of the stream.



QUESTION SIX

Find the integrals

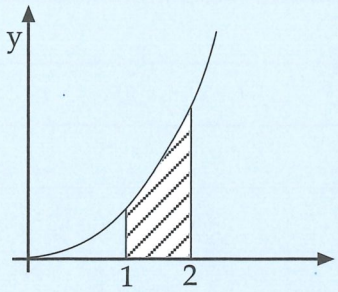
(a) $\int 6\sin 5x \sin 3x \, dx$

(b) $\int \frac{x}{x^2 - 5} \, dx$

(c) $\int \frac{3x - 2}{x - 1} \, dx$

QUESTION SEVEN

Below is a sketch of the graph $y = x e^{x^2}$. Find the area between the curve and the x axis from $x = 1$ to $x = 2$.



QUESTION EIGHT

A radioactive substance is disintegrating at the rate of $0.5e^{-t/25}$ grams per year.

How much of the substance disintegrates during the first 50 years?

QUESTION NINE

A small rural town has experienced a decline in population since 1995. In that year there were 3900 residents and ten years later in 2005, 3220 residents. If the rate of change of the population is proportional to the population, find an equation for the population N in terms of time t years since 1995 and use it to predict the population in 2015.