## 2002/2003

## FINAL EXAMINATION

MATHS 122
Max. Mark: 50

## Question 1 :

Set up the integrals that can be used to find (Do not evaluate)
(a) The area of the region bounded by: $y=x, y=\frac{1}{\sqrt{x}}, x=2$.
(b) The volume of the solid generated by revolving the region bounded by: $x=y^{2}+1$ and $x=2 y+4$, about
i) $y$-axis
ii) $y=-2$

## Question 2:

Evaluate
(a) $\int \frac{x^{2}+1}{x^{2}-x} d x$
(b) $\int \frac{3}{\sqrt{5-4 x-x^{2}}} d x$
(c) $\int \sec h^{-1} 2 x d x$

## Question 3 :

Show whether the followings converge or diverge
(a) $\int_{1}^{2} \frac{1}{x \sqrt{\ln x}} d x$
(b) $\left\{\left(1-\frac{5}{n}\right)^{n}\right\}$
(c) $\quad \sum_{n=1} \frac{\sqrt[3]{n+1}}{n^{2}+1}$

## Question 4 :

Find the interval of convergence of $\sum_{n=1}(-1)^{n-1} \frac{2^{n}}{n^{2}}(2 x-1)^{n}$

## Question 5 :

Use the first three terms of the Maclurian series to approximate
$\int_{0}^{1} \frac{1-e^{-x^{2}}}{x} d x$

## Question 6 :

(a) Find the area of the region outside $r=1-\cos \theta$ and inside $r=3 \cos \theta$.
(b) Set up the integrals (Do not evaluate), that can be used to find the area of the region

Inside both $r=1-\cos \theta$ and $r=3 \cos \theta$.

