# 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 = 2y + 4, about
  - i) y axis

ii) y = -2

#### **Question 2:**

Evaluate

(a) 
$$\int \frac{x^2 + 1}{x^2 - x} dx$$

(b) 
$$\int \frac{3}{\sqrt{5-4x-x^2}} \, dx$$

(c) 
$$\int \sec h^{-1} 2x \, dx$$

#### **Question 3:**

Show whether the followings converge or diverge

(a) 
$$\int_{1}^{2} \frac{1}{x\sqrt{\ln x}} dx$$

(b) 
$$\left\{ \left(1 - \frac{5}{n}\right)^n \right\}$$

(c) 
$$\sum_{n=1}^{\infty} \frac{\sqrt[3]{n+1}}{n^2+1}$$

#### **Question 4:**

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

### **Question 5**:

Use the first three terms of the Maclurian series to approximate

$$\int_{0}^{1} \frac{1 - e^{-x^{2}}}{x} dx$$

## **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  $r=3\cos\theta$ .