Final Exam, M-106, SMT, (2014-15), Department of Mathematics, King Saud University

1. [3+2 Marks]

1.1) Use logarithmic differentiation to find $\frac{dy(x)}{dx}$ where $y(x) = \frac{(x^2+3)^{2x}}{\ln(x+1)}$.

1.2) Evaluate the integral $\int x^2 \sqrt[4]{1-x^3}\, dx$.

2. [3+3 Marks]

2.1) Let A be the area under the graph of $f(x) = 2x + 1, \text{on } [-2,1]$. Find the area A by taking limit of Riemann Sum.

2.2) **Evaluate** $\int \frac{\cos^3(x)}{\sqrt{\sin(x)}} dx$.

3. [3+3+3 Marks]

3.1) Evaluate the integral $\int \frac{2x^3-4x-8}{(x^2-x)(x^2+4)} dx$.

3.2) Sketch the region bounded by the graphs of the equations:

$y = 2 - x^2$; $y = x$. And find its area.

3.3) Evaluate the integral $\int e^x \sin(x)\, dx$.

4. [2.5+2.5 Marks]

4.1) Evaluate the integral $\int \frac{\log(x)}{x} dx$

4.2) Evaluate the integral $\int \frac{\sqrt{x^2-3}}{x} dx$

5. [3+3 Marks]

5.1) Sketch the region R bounded by the graphs of the equations:

$y = \sqrt{\sin(x)}$, $0 \le x \le \pi$. And find the volume of the solid generated if R is revolved about x −axis.

5.2) Find the arc length of the graph of the equation $y = \ln(\cos(x))$ from $x = 0$ to $x = \frac{\pi}{4}$.

6. **[5+4 Marks]**

6.1) Sketch and find the area of the region that is inside for both graphs of the equation $r = 2 - 2\cos(\theta)$ and $r = -6\cos(\theta)$.

6.2) Sketch the graph $C: r = e^{\frac{\theta}{2}}$ from $\theta = 0$ to $\theta = \pi$ and find the area of the surface generated by revolving the graph C about the polar axis.