King Saud University

Faculty of Sciences

Department of Mathematics

Final Examination	Math 106	Trimester II - 1444
	Time: 3H	

Question 1 : (2+2+3)

1. **If** $F(x) = \int_{x^2+1}^{6} \cos\sqrt{t^2+1}dt$. **Find** $F'(x)$.
2. **Compute** $\int \dfrac{dx}{x((\ln x)^2+9)}$
3. **Evaluate the integral** $\int \dfrac{dx}{x\sqrt{1-x^6}}$

Question 2 : (3+3+3)

1. **Find** $\lim\limits_{x\longrightarrow 0^+} \left(\dfrac{1}{x}\right)^{x^2}$.
2. **Compute the indefinite integral** $\int x^4 \ln x dx$.
3. **Evaluate** $\int (\sin x)^5 (\cos x)^6 dx$.

Question 3 : (3+3+3)

1. **Compute** $\int \dfrac{dx}{(16-x^2)^{\frac{3}{2}}}$.
2. **Evaluate** $\int \dfrac{x^2+1}{x^3-x}dx$.

3. **Find the integral** $\int \frac{1}{\sqrt{x} + \sqrt[4]{x}} dx$.

Question 4 : (3+3+3)

1. **Does the integral** $\int_0^1 \frac{dx}{\sqrt{x}(1+x)}$ **converge? Find its value if it does.**
2. **Sketch the region bounded by** $y = x^2, y = x + 6$ **and find its area.**
3. **Find the volume of the solid obtained by revolving the region bounded by the curves** $y = x^2$, $y = 2 - x^2$ **about the** $x-$**axis.**

Question 5 : (3+3)

1. **Compute the arc length of the curve** $x = \frac{1}{3}(y^2+2)^{\frac{3}{2}}$, $0 \leq y \leq 1$.
2. **Sketch the region inside** $r = 2\cos\theta$ **and outside** $r = 1$ **and find its area.**