KING SAUD UNIVERSITY	M-106 Calculus Integration
College of Science	Final Exam
Math Department	Time : 180 minutes

1439 - 1440 II (Summer Semester)

Question 1 : (3+3)

1. Let $f(x) = (1+\cos x)^{2x}$. Calculate $f'(0)$.
2. Find $g(x)$ if $\int e^{x^2} g(x)\,dx = -e^{x^2} + c$, where c is a constant.

Question 2 : (2+2+2) Evaluate the following integrals :

$$\int \left(2^x + 2^{-x} + 1\right)\,dx, \quad \int \frac{1}{\sqrt{e^{2x}-1}}\,dx, \quad \int \frac{1}{\sqrt{x}\sqrt{x+4}}\,dx$$

Question 3 : (2+2+3) Evaluate the following integrals :

$$\int \frac{1}{x\sqrt{1-x^8}}\,dx, \quad \int \frac{1}{(25-x^2)^{\frac{3}{2}}}\,dx, \quad \int \frac{x^2+12x+3}{x^3-4x}\,dx$$

Question 4 : (3+3+3)

1. Determine if the following integral is convergent or divergent. If it is convergent, find its value : $\displaystyle\int_1^{+\infty} \frac{\ln x}{x}\,dx.$
2. Find the area bounded by the graphs of the curves of $y = x^2+1$, $y = 2x$ and $x = 0$.
3. Find the volume of the solid of revolution generated by revolving the region bounded by the graphs of the curves $y = x^2$ and $y = 1 - x^2$ around the x-axis.

Question 5 : (3+3+3+3)

1. Find the arc length of the curve : $y = \cosh x$, for $0 \leq x \leq 4$.
2. Find the points on the polar curve : $r(\theta) = 2\cos\theta$, $0 \leq \theta \leq \pi$ at which the tangent line to r is vertical.
3. Find the area of the region bounded by the polar curves $r = \tan\theta$, $\theta = 0$ and $\theta = \frac{\pi}{4}$.
4. Find the surface area generated by revolving the polar curve : $r = \cos\theta$, $-\frac{\pi}{2} \leq \theta \leq \frac{\pi}{2}$, arround the y-axis.

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