King Saud University
Department of Mathematics
College of Sciences

Second Semester 2012/13

**Integral Calculus (M-106), Serie N: 3**

**Exercise 1:**

Evaluate the integral.

$$1)\int_1^4 (x^2-4x-3)dx \qquad 2)\int_4^9 \frac{t-3}{\sqrt{t}}dt \qquad 3)\int_1^0 s^2(\sqrt[3]{s}-\sqrt{s})ds$$

$$4)\int_3^2 \frac{x^2-1}{x-1}dx \qquad 5)\int_{-1}^{-2} \frac{2t-7}{t^3}dt \qquad 6)\int_1^4 \sqrt{16x^5}dx$$

$$7)\int_{-3}^6 |x-4|\,dx \qquad 8)\int_{-2}^{-1} (x-\tfrac{1}{x})^2dx \quad 9)\ \int_{-\frac{\pi}{6}}^{\frac{\pi}{6}} (x+\sin 5x)dx$$

**Exercise 2:**

*a*) Find a number $z$ that satisfies the conclusion of the mean value theorem for the given interval $\int_a^b f(x)dx$, and *b*) Find the average value of $f$ on $[a,b]$ :

$$1)\int_0^4 \frac{x}{\sqrt{x^2+9}}dx \qquad 2)\int_{-2}^0 \sqrt[3]{x+1}dx$$

**Exercise 3:**

*a*) Find the derivatives without integrating:

$$1)\frac{d}{dx}\int_0^3 \sqrt{x^2+16}dx \qquad 2)\frac{d}{dx}(x\int_0^3 \sqrt{x^2+16}dx)$$

$$3)\frac{d}{dx}\int_0^x \tfrac{1}{\sqrt{1-t^2}}dt,\ \ |x|<1 \qquad 4)\frac{d}{dx}\int_{-x}^x \frac{1}{t+1}dt$$

$b$) Find the derivatives

$$1)\frac{d}{dx}\int_2^{x^4}\frac{t}{\sqrt{t^3+2}}dt \qquad 2)\frac{d}{dx}\int_{\frac{1}{x}}^{\sqrt{x}}\sqrt{t^4+t^2+4}dt$$

$$1)\frac{d}{dx}(\sin(x)\int_2^{x^4}\frac{t}{\sqrt{t^3+2}}dt) \quad 2)\frac{d}{dx}(\tan(x)\int_{\frac{1}{x}}^{\sqrt{x}}\sqrt{t^4+t^2+4}dt)$$

**Exercise 4:**

Use Simpson's and Trapeziodal rule, with $n = 4$, to approximate the average of $f$ on the given interval.

1) $f(x) = \frac{1}{x^4+1}$; $[0, 4]$

2) $f(x) = \sqrt{\cos x}$; $[-1, 1]$.