King Saud University First Semester 2013/14
Department of Mathematics
College of Sciences

Integral Calculus (M-106), S. 4

Exercise 1:

Find $f'(x)$ if $f(x)$ is the given expression.

$1) x \ln x$ $\quad$ $2) \ln(\ln x)$ $\quad$ $3) \dfrac{1}{\ln x} + \ln \dfrac{1}{x}$

$4) \ln |5x^2 - 1|^3$ $\quad$ $5) \ln(\sqrt{4x-5}(3x+8)^2)$ $\quad$ $6) \ln \dfrac{\sqrt{x^2+1}}{(9x-4)^2}$

$7) \ln(\ln(\sec 2x))$ $\quad$ $8) \cos(\ln 2x)$ $\quad$ $9) \ln |\csc x - \cot x|$

Exercise 2:

a) Use implicit differentiation to find $y'(x)$.

1) $x \ln y(x) - y(x) \ln x = 0$ $\quad$ 2) $xy^3(x) + x^3 \ln y(x) = 5x + 3$

b) Use logarithmic differentiation to find $\dfrac{dy(x)}{dx}$.

$1) y(x) = \sqrt{4x+7}(x-5)^3$ $\quad$ $2) y(x) = (x+1)^2(x+2)^3(x+3)^4$ $\quad$ $3) y(x) = \dfrac{(x^2+3)^5}{\sqrt{3x+1}}$

Exercise 3:

a) Find $f'(x)$ if $f(x)$ is the given expression.

$1) e^{\sqrt{x+1}}$ $\quad$ $2) e^{\sqrt{x}} + \sqrt{e^x}$ $\quad$ $3) e^{\sin 5x}$

$4) e^{-3x} \cos 3x$ $\quad$ $5) \dfrac{e^x - e^{-x}}{e^x + e^{-x}}$ $\quad$ $6) e^{-x} \tan^2 x$

$7) x e^{\cot x}$ $\quad$ $8) \ln(\csc e^{3x})$ $\quad$ $9) \dfrac{x}{e^{-x^2}}$

b) Use implicit differentiation to find $y'(x)$.

1) $e^x \cos y = xe^y$ 2) $xe^y + 2x - \ln(y+1) = 3$

Exercise 4:

Evaluate the integral.

1)

$$a)\int \frac{1}{4-5x}dx \quad b)\int_{-1}^{0} \frac{1}{4-5x}dx$$

2)

$$a)\int \frac{3x}{x^2+4}dx \quad b)\int_{1}^{2} \frac{3x}{x^2+4}dx$$

3)

$$a)\int x^2 e^{3x^3}dx \quad b)\int_{1}^{2} x^2 e^{3x^3}dx$$

4)

$$a)\int \cot(\tfrac{1}{3}x)dx \quad b)\int_{\frac{3\pi}{2}}^{\frac{3\pi}{2}} \cot(\tfrac{1}{3}x)dx$$

5)

$$a) \int (\csc x - 1)^2 dx \quad b) \int e^{2x}\sec e^{2x}dx \quad c)\int (\tan 3x + \sec 3x)dx \quad d)\int \frac{\cot\sqrt[3]{x}}{\sqrt[3]{x^2}}dx$$

Exercise 5:

Solve the differential equation subject to the given conditions.

1)

$$y'(x) = 4e^{2x} + 3e^{-2x};\ y = 4 \text{ if } x = 0$$

2)

$$y^{'}(x) = 3e^{4x} - 8e^{-2x}; y = -2 \text{ if } x = 0$$

Exercise 6:

Find $f^{'}(x)$ if $f(x)$ is given expression.

$$\begin{array}{ccc} 1)7^x & 2)5^{-x} & 3)8^{x^2+1} \\ 4)(10^x + 10^{-x})^{10} & 5)\log_5 \left|\frac{1-x^2}{2-5x^3}\right| & 6)x^{\tan x} \\ 7)(\cos 2x)^{2x} & 8)\ (x\pi)^x & 9)(\log_2 |x|\, \pi)^x \end{array}$$

Exercise 7:

Evaluate the intergal.

1)

$$\begin{array}{cc} a)\int 7^x dx & aa)\int_{-2}^{1} 7^x dx \\ b)\int 2^{3x-1} dx & bb)\int_{-1}^{1} 2^{3x-1} dx \\ c)\int 6^{-6x} dx & cc)\int_{1}^{2} 6^{-6x} dx \end{array}$$

2)

$$\begin{array}{cc} a)\int x3^{-x^2} dx & b)\int \frac{(2^x+1)^2}{2^x} dx \\ c)\int \frac{2^x}{2^x+1} dx & d)\int 3^{\cos x} \sin x dx \\ e)\int e^{\pi} dx & f)\int \frac{10^{\sqrt{x}}}{\sqrt{x}} dx \end{array}$$