MATH150 Introduction to Ordinary Differential Equations, Spring 2010-11
Week 01 Revision worksheet: Differentiations and Integrations   (Ver. T1A)

Name: _____   ID No.: _____   Tutorial Section:_____

Attempt at least FOUR questions from the following questions! The worksheet MUST be handed in at the end of the tutorial

(*Partial solution of this worksheet will be available at the course website a week after all the tutorials*)

1. **(Demonstration)** Do two/three differentiation problems for each of the categories below

   (a) Simply polynomials which may have negative powers;

   (b) simple (polynomials/rational) functions that require product/quotient rules;

   (c) (polynomials/rational) simple functions that require chain rule;

   (d) repeat the above for trigonometic functions when time allowed.

   Students should be allowed time to do some class problems before turning to integration problems.

2. **(Demonstration)** Do two/three problems in integration of functions that require either one or a combination of

   (a) simple power law;

   (b) substitution;

   (c) trigonometric functions;

   (d) integration by parts.

3. **(Class work)** Find dy/dx for the following functions:

   (a) $y = 5x^4 + x^2 + x$:   _____

   (b) $y = x^3 + \frac{1}{x^3}$:   _____

   (c) $y = (x^2 + 1)^2(2x + 3)$:   _____

   (d) $y = \dfrac{x^2 + 1}{x^2 - 1}$:   _____

   (e) $y = \sqrt{1 + x^2}$:   _____

   (f) $y = (1 + 3x)^4$:   _____

   (g) $y = \dfrac{\sin x}{x}$:   _____

   (h) $y = (\ln x)^2$:   _____

4. **(Class work)** Find $\int f(x)dx$ for the following functions:

(a) $\int x^3 dx$: _____

(b) $\int \frac{1}{\sqrt{x}} dx$: _____

(c) $\int (ax+b)^n \, dx$: _____

(d) $\int \frac{1}{(ax+b)^n} \, dx$: _____

(e) $\int \frac{1}{(ax+b)} \, dx$: _____

(f) $\int \sin 3x dx$: _____

(g) $\int x \cos(1+x^2) dx$: _____

(h) $\int x \sin x dx$: _____

5. **(Supplementary problems)** Find dy/dx for the following functions:

   (a) $y = \sqrt{x}(3x-2)$;
   (b) $y = (1+2x)^5$;
   (c) $y = \sqrt[3]{1+x^2}$;
   (d) $y = \cos 2x$;
   (e) $y = \cos^2 x$;
   (f) $y = \cos x \sin x$;
   (g) $y = \tan x$;
   (h) $y = e^{2x}$;
   (i) $y = e^x \cos x + e^{-x} \sin x$;
   (j) $y = e^x \ln x$;
   (k) $y = \ln(xe^x)$;

6. **(Supplementary problems)** Find $\int f(x)dx$ for the following functions:

   (a) $\int (2\sqrt{x} + 3x^3)dx$;
   (b) $\int x^2 \cos x^3 dx$;
   (c) $\int \sin(1+x)dx$;
   (d) $\int x \cos(1+x^2) \, dx$;
   (e) $\int x \ln x dx$;
   (f) $\int x^2 e^x dx$;
   (g) $\int e^x \sin x dx$.