2012 Summer Math Course for Direct Entry Students,
Computer Science Department, HKUST.

Tutorial 11: Indefinite Integrals

1. Evaluate each of the following integrals:

   (a) $\int(3x^2 - 2x + 1)dx$.

   (b) $\int(4x^5 - 3x^3 + 9x)dx$.

   (c) $\int \frac{dx}{x^4}$.

   (d) $\int \frac{3dx}{\sqrt[3]{x}}$.

   (e) $\int(3\sqrt{x} + \frac{2}{\sqrt{x}})dx$.

   (f) $\int(4x^{\frac{2}{3}} + \frac{3}{x^{-\frac{1}{3}}})dx$.

   (g) $\int(\frac{1}{x^4} - \frac{1}{2\sqrt[3]{x}})dx$.

   (h) $\int(x + 3)\sqrt{x}dx$.

   (i) $\int \sqrt[5]{x^3}(5x - 6)dx$.

   (j) $\int \frac{3x^2+2x-1}{\sqrt{x}}dx$.

2. Prove each of the following standard results of indefinite integrals:

   (a) $\int e^x dx = e^x + C$ where C is a constant.

   (b) $\int a^x dx = \frac{a^x}{lna} + C$ where C is a constant.

3. Evaluate each of the following integrals:

   (a) $\int(2^x + 3^x)^2 dx$.

   (b) $\int \frac{5x}{\sqrt{9-4x^2}}dx$.

   (c) $\int \frac{1}{x\ln x}dx$.

   (d) $\int \frac{e^{2x}}{(e^x+1)^{\frac{1}{4}}}dx$.

   (e) $\int \frac{\ln x}{x\sqrt{1+\ln x}}dx$.

   (f) $\int \frac{x}{2x^2-x-3}dx$.

4. Evaluate each of the following integrals:

   (a) $\int \frac{dx}{x^2-a^2}$.

   (b) $\int \frac{2x-1}{9x^2+1}dx$.

   (c) $\int \frac{x^2+1}{x^2+3x+2}dx$.

   (d) $\int \frac{e^{2x}}{\sqrt[5]{1-e^x}}dx$.

   (e) $\int \frac{dx}{1+e^x}$.