Fundamental Mathematics for Robotics
Homework Set #10, Dr.T

[1] Find the following anti-derivatives using the Rules of integration. Make sure that you state the Rules you used.

(a) $\int x^6 dx$

(b) $\int \frac{2}{y^3} dy$

(c) $\int \sqrt{x} dx$

(d) $\int 3z^{2.5}\, dz$

[2] Repeat Problem [1] with the following:

(a) $\int e^{-2t}\, dt$

(b) $\int 3e^{-3x}\, dx$

(c) $\int e^{-4y+3}\, dy$

[3] Repeat Problem [2] with the following:

(a) $\int 3\cos 2t\, dt$

(b) $\int \sin(-2x)\, dx$

(c) $\int (3\sin 2y - 2\cos 3y)\, dy$

[4] It is convenient to have a formula for reducing the power of x in the integral of the product of x to the n-th power and an exponential function. Prove the following formula that can realize this reduction.

$$\int x^n e^{ax}\, dx = \frac{1}{a} x^n e^{ax} - \frac{n}{a} \int x^{n-1} e^{ax}\, dx$$