Phys 208 – Homework (HW12) – SP13 (Due Wednesday, February 27, 2013)

Read the following: Ch 4-Sect 12 Differentiation of integrals; Leibniz' Rule
Ch 5- Sect 4 Change of variables in integrals; Jacobians

Ch 4 – 4.12.3, 4.12.4, 4.12.8, 4.12.10, 4.12.11, 4.12.14, 4.12.15

Answers: 4.12.8 $dx/du = e^{x^2}$ 4.12.11 $3x^2 - 2x^3 + 3x - 6$

Phys 208 – Homework (HW13) – SP13 (Due Friday, March 1, 2013)

Read the following: Ch 6 -- Sect. 4 Differentiation of Vectors

Problems: Ch 5 – 5.4.14, 5.4.19, 5.6.25, 5.6.27

Answers: 5.6.25 $\pi/2$

HW13.1 Verify the integral in problem 4.12.15, namely that $\int_0^\infty e^{-ax}\sin kx\,dx = \dfrac{k}{a^2+k^2}$. Carry out the integral $\int_0^\infty e^{-ax}e^{ikx}dx$ to determine both of the integrals $\int_0^\infty e^{-ax}\sin kx\,dx$ and $\int_0^\infty e^{-ax}\cos kx\,dx$.

HW13.2 Find the general form for the integral $I_n = \int_0^\infty \dfrac{dx}{(y^2+x^2)^{n+1}}$ for n = 1, 2, 3, …, given that $I_0 = \int_0^\infty \dfrac{dx}{y^2+x^2} = \dfrac{\pi}{2y}$. Hint: set $a = y^2$ and take derivatives with respect to a to generate the desired integral. Answer: $I_n = \dfrac{\pi(2n-1)!!}{n!2^{n+1}y^{2n+1}}$.

HW 13.3 (4.12.16) In the kinetic theory of gases one has to evaluates integrals of the form

$I_m = \int_0^\infty t^{2m}e^{-at^2}dt$. Given that $\int_0^\infty e^{-at^2}dt = \frac{1}{2}\sqrt{\frac{\pi}{a}}$, evaluate I_m for m = 1, 2, 3, …

Answer: $I_m = \dfrac{(2m-1)!!}{2^{m+1}a^m}\sqrt{\dfrac{\pi}{a}}$.