Math 21B
Kouba
Discussion Sheet 6

1.) A population of wild hogs is growing exponentially. Ten years ago there were 45 wild hogs and three years ago there were 120 wild hogs. How many wild hogs will there be fifteen years from now ?

2.) Tritium is a radioactive material with a half-life of 12.3 years. A sample of Tritium presently contains 400,000 atoms. Assuming exponential decay,
    a.) how many atoms will be in the sample 50 years from now ?
    b.) how many atoms were in the sample 100 years ago ?

3.) Carbon-14 has a half-life of 5730 years. A fossilized bone fragment contains 5.6% of the Carbon-14 it had as a living organism. How old is the fossil ?

4.) Use integration by parts to write a recursion (reduction) formula for each of the following (n is a positve integer and b is a constant).

    a.) $\int x^n e^{bx} \, dx$ b.) $\int \tan^n(bx) \, dx$ HINT: $\tan^2 \theta = \sec^2 \theta - 1$

5.) Use the integral table on the inside cover of your calculus book to integrate the following.

    a.) Use formula #24 for $\int \sqrt{\dfrac{x+3}{4-x}} \, dx$

    b.) Use formula #21 for $\int \dfrac{\sec^2 x}{\tan x \, \sqrt{3\tan x + 4}} \, dx$

    c.) Use formula #34 for $\int \left(4 - (9x)^2\right)^{\frac{3}{2}} \, dx$

    d.) Use formula #34 for $\int \left(3 - x^2 - 2x\right)^{\frac{3}{2}} \, dx$

6.) Use trig substitution to integrate the following.
    a.) $\int \dfrac{1}{\sqrt{1-x^2}} \, dx$ b.) $\int \dfrac{1}{x\sqrt{x^2+9}} \, dx$ c.) $\int x^3 \sqrt{x^2 - 4} \, dx$

7.) Use any method to integrate the following.
    a.) $\int \dfrac{1}{\sqrt{x}(1+\sqrt{x})} \, dx$ b.) $\int \dfrac{\sqrt{x}}{1+\sqrt{x}} \, dx$ c.) $\int \dfrac{1+\sqrt{x}}{\sqrt{x}} \, dx$ d.) $\int \dfrac{1}{\sqrt{x}\sqrt{1-x}} \, dx$

THE FOLLOWING PROBLEM IS FOR RECREATIONAL PURPOSES ONLY.

8.) You have 8 black socks, 12 blue socks, 10 gray socks, and 5 white socks randomly scattered in your bureau drawer. If you reach into the drawer without looking, how many socks must you take out to be sure of having a matching pair of socks ?