Math for Applied Biomedical Engineering Review Quiz
Dr. Daniel Rio

The first set of problems is from your text Riley, K. F., Hobson, M. P. (2011) Essential Mathematical Methods for the Physical Sciences:

Chapter 1 – problems 1.5 1.16 1.22 1.36

Chapter 2 – problems 2.6 2.11

Chapter 3 – problems 3.2 3.7 3.28

Here are some additional problems to also answer:

(R1) Integrate $\int_0^2 \int_x^{2x} (x+y)^2 \, dy \, dx$

(R2) Evaluate volume of a ball using the integral $\dfrac{1}{3} \iint_S r \cos\phi \, dA$

where dA maps out the surface of the ball. Note ϕ is not the spherical coordinate (see hint below), it represents the angle that a vector from the origin to the surface of the ball makes with the normal to the surface of the ball. In this case that is 0.
HINT: Use spherical coordinates to easily evaluate the integral.

(R3) Solve $y^{(4)} + 2y'' + y = 0$

(R4) Solve $4y'' - 4y' - 3y = 0$; $y(-2) = e$ $y'(-2) = -e/2$

(R5) Solve the following system

$$\frac{dx}{dt} = -k_1 x + k_2 y, \quad x(0) = 2$$

$$\frac{dy}{dt} = k_1 x - k_2 y, \quad y(0) = 0$$

(R6) Given

$$P_n(x) = \sum_{m=0}^{M} (-1)^m \frac{(2n-2m)!}{2^n m!(n-m)!(n-2m)!} x^{n-2m}$$

$M = n/2$ or $(n-1)/2$ whichever is an integer
Obtain P_6 and P_7