Exercise 1

$$x(u) = x(u_0) + x_u(u_0)(u - u_0) + (1/2)x_{uu}(u_0)(u - u_0)^2 + (1/6)x_{uuu}(u_0)(u - u_0)^3$$

where we can derive x_u, x_{uu}, x_{uuu} to be:

$$x_u(u) = -\frac{F_u}{F_x}$$

$$x_{uu}(u) = -\frac{F_{xx}(x_u)^2 + 2 * F_{xu} * x_u + F_{uu}}{F_x}$$

$$x_{uuu}(u) = -\frac{F_{xxx}(x_u)^3 + 3(F_{xxu} * (x_u)^2 + F_{xuu} * (x_u) + F_{xu} * (x_{uu}) + F_{xx} * (x_{uu} * x_u)) + F_{uuu}}{F_x}$$