1. A consulting firm arrived at the following Cobb-Douglass function for a particular product:

\[ N(x, y) = 50x^{0.7}y^{0.3} \]

where \( x \) is the number of units of capital and \( y \) is the number of units of labor.
Each unit of capital costs $40 and each unit of capital costs $80. The company has $400,000 to
invest. How should the money be allocated to maximize production?
(Use Lagrange multipliers)

2. If instead, the price of capital goes up to $60 a unit, how should the investment money be
allocated.
(Use Lagrange multipliers)
Lecture Problems

3. For each of the following first order linear differential equations:

1) Write the DE as $y' + f(x)y = g(x)$.
2) Find the integrating factor, $I = e^{\int f(x) \, dx}$
3) Multiply the differential equation by $I$.
4) Recognize the product rule in your differential equation.
5) Integrate your DE, solve.
6) Use initial condition (if any).

   (a) $2y' + 4y = 1$

   (b) $y' = y - x$

   (c) $y' - \frac{y}{x} = 2$

   (d) $y' + y = x - 1$

   (e) $y' + x^2y = x^2$