Calculus review:

1. Find the derivative of \( y = f(x) = \ln(2x) \). Is this function concave or convex? How do you know?

2. Let \( y = f(x_1, x_2) = x_2^2 + 2x_1x_2 + x_2 + 3 \). Find the first partial derivatives with respect to each variable, \( x_1 \) and \( x_2 \).

3. Find the first and second derivatives of \( y = f(x) = (3 - x^2)^3 \). What rules do you need to use?

4. Find the maximum of \( y = f(x) = -3x^2 + 2x + 5 \).

Microeconomics Review:

5. Suppose that demand for apartments (where \( x \) is the quantity of apartments demanded and \( p \) the price of apartments) can be given by \( p = 600 - 50x \). Plot this equation on a graph that has \( p \) on the vertical axis and \( x \) on the horizontal axis.

6. Now let the long run supply of apartments be given by the equation \( p = 100x \). Plot this equation on the same graph as you drew for the previous question.

7. Solve for supply and demand in terms of quantities. That is, solve each equation so it gives \( x \) as a function of \( p \) (e.g., \( x = ap + b \)).

8. Solve for the equilibrium. That is, solve for the \( x \) and \( p \) where supply equals demand.

9. Look at your graph, does the analytical result make sense?

10. Now let’s consider a comparative static. How does the equilibrium price change if landlords pay a tax of $100 per unit they rent. Such that the new supply curve can be represented by \( p = 100x + 100 \)?