Econ 310 Week 1 Homework
Due: Tuesday 9/3

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1. Supply and demand are given by the following equations:

$$q_d = 120 - p$$
$$q_s = 2p - 30$$

Calculate the equilibrium price and quantity in this market.

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2. Supply and demand are given by:

$$q_d = 120p^{-1/3}$$
$$q_s = 60p^{2/3}$$

Calculate the equilibrium price and quantity.

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3. Solve the following equation for x:

$$4x^{-3} = 256$$

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4. Simplify:

$$\frac{4x^{1/3}y^{-2/3}}{12x^{-2/3}y^{1/3}}$$

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5. Write y as a function of x:

$$8x^{3/4}y^{1/4} = 16$$

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6. If $\ln y - \ln x = -0.05$, then y is larger or smaller than x by how many percent?

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7. $f(x) = 10 + 24x - x^2$

    a. Write down the first derivative, $f'(x)$.

    b. What choice of x maximizes $f(x)$? What is the maximum of $f(x)$?

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8. $f(x) = 12x^{1/2} - 3x$

    a. Write down the first derivative, $f'(x)$.

    b. What choice of x maximizes $f(x)$? What is the maximum of $f(x)$?

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9. A firm is deciding how much output to produce, q. It can sell its output at a price of $p = 14$. The firm's cost function is:

$$c(q) = 2q + \tfrac{1}{4}q^2$$

    a. Write down the firm's profit function in terms of q and write down the first derivative.

    b. What choice of q maximizes the firm's profit? What is the maximum attainable profit?

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10. A firm is deciding how much output to produce, q. It can sell its output at a price of p. The firm's cost function is:

$$c(q) = a + bq + cq^2$$

    a. Write down the firm's profit function in terms of p, q, a, b, and c. Find the first derivative of the profit function.

    b. What choice of q maximizes the firm's profit? Write the answer in terms of p, a, b, and c.

    c. What is the maximum attainable profit? Write the answer in terms of a, b, and c.