1. **Intuition:** Answer the following questions.

   a.) Suppose the market price for University of Oregon t-shirts is $42. For a perfectly competitive firm, what is the marginal revenue of supplying a UO t-shirt?

   MR=P=$42

   b.) On the demand side, consumption occurs when marginal benefit equals marginal cost. What quantity should a firm produce?

   Firms should produce a quantity such that the marginal cost at that point equals the marginal revenue.

2. Recall that, to find the marginal utility of a good, we took the first derivative of the utility function with respect to the good. For each of the following production functions, derive the marginal productivity of labor and the marginal productivity of capital.

   a.) $F(K,L) = 5K^{.3}L^{.7}$

   $$F_L(K,L) = .7(5)K^{.3}L^{-.3}$$
   $$F_K(K,L) = .3(5)K^{-.7}L^{.7}$$

   b.) $F(K,L) = 0.5K^2L$

   $$F_L(K,L) = 0.5K^2$$
   $$F_K(K,L) = 2(.5)KL$$

   c.) $F(K,L) = K + 4L$

   $$F_L(K,L) = 4$$
   $$F_K(K,L) = 1$$

3. For each of the following production functions, determine how output changes when we double both capital in labor: $F(2K, 2L)$. Assume we start with $K = 1$ and $L = 2$. Then, compare the outcome of doubling inputs with the outcome of doubling the original production: $2F(K,L)$.

   a.) $F(K,L) = K^2L^3$

   $$F(1,2) = 1^2 * 2^3 = 8$$
   $$F(2*1, 2*2) = F(2,4) = 2^2 * 4^3 = 4 * 64 = 256$$
   $$2F(1,2) = 2 * 8 = 16$$
   $$2F(K,L) < F(2K, 2L)$$

b.) $F(K, L) = K^{0.2}L^{0.3}$

Hints: $2^{.3} \approx 1.23$ // $2^{.2} \approx 1.15$ // $4^{.3} \approx 1.52$

$$K(1,2) = 1^{.2} * 2^{.3} \approx 1.23$$
$$K(2,4) = 2^{.2} * 4^{.3} \approx 1.15 * 1.23 \approx 1.41$$
$$2F(1,2) = 2 * 1.23 = 2.46$$
$$2F(K, L) > F(2K, 2L)$$

c.) $F(K, L) = K^{0.5}L^{0.5}$

$$K(1,2) = 1^{.5} * 2^{.5} = \sqrt{2}$$
$$K(2,4) = 2^{.5} * 4^{.5} = \sqrt{2} * 2$$
$$2F(1,2) = 2 * \sqrt{2}$$
$$2F(K, L) = F(2K, 2L)$$

When $F(2K, 2L) = 2F(K, L)$, what is true about the exponents in the above Cobb-Douglass production functions?

The exponents sum to 1.