Your Name: _____

1. Let $f(x, y) = (2 + 3x^2 y^2)^{1/2}$. Show calculations to verify that using power rule with chain rule, we get $f_y = 3x^2 y(2 + 3x^2 y^2)^{-1/2}$.

2. Let $f(x, y) = xye^x$. Show calculations to verify that by using product rule we get $f_{xy} = e^x + xe^x$.

3. Using s highly skilled workers, and u untrained workers, the Bluth Factory can produce

$$Q(s, u) = 2e^{0.5s}u$$

Cornballers per day.

(a) Compute $Q_s(4, 6)$ and $Q_u(4, 6)$.

(b) Interpret your computations from part (a) in context.

(c) Compute Q_{ss} and Q_{uu}.

(d) Based on your answers in part (c), is production increasing at an increasing rate when considering adding more skilled workers? What about when considering adding more untrained workers?

4. Consider the demand for two goods, $A(x, y)$ is the demand for product A at a price of x per unit of product A and price y per unit of product B. $B(x, y)$ is the demand for product B.

   (a) Why should it be true that $A_x < 0$ and $B_y < 0$, for all positive values of x and y? (Think about how the demand for a product changes with its price)

   (b) Suppose we find that $A_y > 0$ and $B_x > 0$. Are products A and B substitute goods, complementary goods, or neither?

5. Annual profits for the tech giant Pear Inc. are given by

$$F(A, P) = 60A + 90P + 2PA - 120$$

million dollars from the sale of A million meTablets and P million mePhones.

(a) Currently sales are 11 million mePhones and 8 million meTablets. At what rate is profit changing as we consider the sales of mePhones increasing while sales of meTablets are held constant? What about the rate as we consider the sales of meTablets increasing while sales of mePhones are held constant?

(b) Suppose that t years from now, mePhone sales are $p(t) = 11 + 0.2t$ million per year. Similarly, meTablets are changing according to the formula $a(t) = 8 - 0.01t$. At what rate is Pear Inc.'s annual profit changing *with respect to time* one year from now?