

Math for Intermediate Economics

The Economics major requires differential calculus at the level of Math 1110. As described on the [Math Recommendations](#) page of the Department of Economics website, this requirement can be satisfied in a number of ways. In the past, some students who had formally satisfied the requirement were not fully prepared for the calculus in the intermediate courses, so we have provided the problems below for you to assess your readiness.

If you have placement credit for Math 1110 and find the problems below foreign, you should strongly consider taking Math 1110 before, or concurrent with, the intermediate courses. If you have taken Math 1110 and are still unable to solve the problems below, you are encouraged to further prepare before taking the intermediate courses. You can seek help at the [Economics Tutoring Center](#) in Uris 429 or the [Math Support Center](#) in 256 Malott.

1. Find dy/dx in (a) through (e) below, where a and b are positive constants.

a. $y = ax^2 + bx$

b. $y = b \ln(ax)$

c. $y = ae^{bx}$

d. $y = bz^2$ and $z = ax + 5$

e. $y = (ax-b)/(x-a)$

2. Find the maximum in each of the problems below.

a. $f(x,y) = -(x-1)^2 - (y-1)^2$ where x and y are real numbers.

b. $f(x,y) = xy$ where x and y are real numbers and $x+y = 10$.

3. Suppose that there is a firm for which the cost of producing x units of output is $c(x) = x^2$.

a. What is the marginal cost of production, dc/dx , when the firm is making 4 units?

b. Does the marginal cost of production increase or decrease as more units are produced.

4. The revenue of the only firm in a market is $R = pq$ where p is price and q is quantity. The firm can produce up to 10 units, and the price in the market depends on the number of units the firm produces: $p = 10 - q$.

- a. Write R as a function of q only, that is, substitute in for p .
- b. Using the formula for R calculated in part (a), solve for $M = dR/dq$?
- c. What is dM/dq ?
- d. At what value(s) of q does M reach its maximum value?

5. Suppose $Q = K^a L^b$ where K is capital, L is labor, a and b are positive constants, and $a + b = 1$.

- a. Treating K as a constant, what is $M = dQ/dL$?
- b. Treating L as a constant, what is dM/dK ?
- c. Express $\ln(Q)$ as a function of $\ln(K)$ and $\ln(L)$.
- d. Suppose both K and L are increased by the same multiplicative constant c . What happens to the value of Q ?