

1. Compute the maximal and minimal values of $f(x, y) = x^2y + x + y$ subject to the constraint $xy = 4$.

2. By investing x units of labor and y units of capital, a low-end watch manufacturer can produce $P(x, y) = 50x^{0.4}y^{0.6}$ watches. Find the maximum number of watches that can be produced on a budget of \$20,000 if labor costs \$100 per unit and capital costs \$200 per unit.

3. Find the point on the plane $2x + y + z = 4$ which is closest to the origin.