

1. Given $f(x) = (7x + 3)e^x + \ln(x + 4)$. Find $f'(x)$, $f''(x)$.
2. Given the total revenue $R(x) = 52x - 0.5x^2$ and the total cost $C(x) = 30x + 1$.
 - a) Find the marginal revenue function.
 - b) Find the maximum profit and the number of units that must be produced and sold in order to yield this maximum profit.
3. A company is designing an open-top, rectangular container that will be twice as long as it is wide and must have a volume of 6 m^3 . The cost of making the bottom of container is 5\$ per square meter, and the cost of the sides is 7\$ per square meter. Find the dimensions of the container that will minimize total cost.
4. Evaluate the integral $\int (3x - 2)e^x dx$.

5. A firm's marginal revenue and marginal cost functions are given by

$$MR = R'(x) = 240 - 0.6x^2 \quad \text{and} \quad MC = C'(x) = 150 + 0.3x^2.$$

Fixed costs are 50 and $R(0) = 0$.

- a) Write down an expression for total revenue $R(x)$.
 - b) Write down an expression for the total cost function $C(x)$.
 - c) Determine the maximum profit.
6. Given the demand function $D(x) = \frac{120}{\sqrt{x+32}}$ and the supply function $S(x) = 10\sqrt{x}$. Calculate
 - a) The equilibrium point.
 - b) The consumer surplus at the equilibrium point.
 - c) The producer surplus at the equilibrium point.
 7. Find the relative maximum and minimum values of

$$f(x, y) = 2x^3 - 6xy - 12x + 3y^2 + 1.$$

8. Consider the following data showing the average life expectancy of men in various years.

Year	1980	1990	2000	2010	2020
Life expectancy of men, (years)	67.6	70.1	73.8	75.2	76.1

- a) Find the regression line.
- b) Use the regression line to predict the life expectancy of men in 2030.