

MTH 201 – Business Calculus: Sample Final Exam

2025

Time: 90 minutes

1. a) Given $f(x) = e^x(x^2 + x + 1)$, find $f'(x)$, $f''(x)$.
b) Find local maximum and local minimum of the function $f(x) = (x^2 - 3)e^x$.
2. A rectangular box with a square base and a cover is to have a volume of 1000 ft^3 . If the cost per square foot for the bottom is \$3, for the top is \$1, and for the sides is \$2, what should the dimensions be in order to minimize the cost?
3. A manufacturer determines that in order to sell x units of a good, the price per unit, in dollars, must be $p(x) = 100 - x$. The manufacturer also determines that the total cost of producing x units is given by $C(x) = \frac{1}{3}x^3 - 6x^2 + 89x + 100$.
 - a) Find the total revenue $R(x)$.
 - b) Find the total profit $P(x)$.
 - c) How many units must the company produce and sell in order to maximize profit?
 - d) What is the maximum profit?
 - e) What price per unit must be charged in order to make this maximum profit?
4. Evaluate the integral $\int (x + 2)e^{3x} dx$.
5. Great Green, Inc., determines that its marginal revenue per day is given by $R'(t) = 75e^t - 2t$, $R(0) = 0$, where $R(t)$ is the total accumulated revenue, in dollars, on the t th day. The company's marginal cost per day is given by $C'(t) = 75 - 3t$, $C(0) = 0$, where $C(t)$ is the total accumulated cost, in dollars, on the t th day.
 - a) Find the total profit from $t = 0$ to $t = 10$ (the first 10 days).
 - b) Find the average daily profit for the first 10 days. See textbook, page 429.
6. Given the demand equation $D(x) = 13 - x$, for $0 \leq x \leq 13$ and supply equation $S(x) = \sqrt{x + 17}$. Calculate
 - a) The equilibrium point.
 - b) The consumer surplus at the equilibrium point.
 - c) The producer surplus at the equilibrium point.
7. A computer company has the following Cobb-Douglas production function for a certain product $p(x, y) = 200x^{3/4}y^{1/4}$, where x is the labour, measured in dollars, and y is the capital, measured in dollars. Suppose that the company can make a total investment in labor and capital of \$20000. What amount of labor and capital would maximize production?

8. Find the relative maximum and minimum values of

$$f(x, y) = 3x^2 - 6xy + y^3 - 9y + 1$$

9. Consider the following data showing the average life expectancy of men in various years. Note that x represents the actual year.

Year, x	1980	1990	2000	2010
Life Expectancy of Men, y (years)	70.0	71.8	74.1	75.4

- a) Find the regression line, $y = mx + b$.
- b) Use the regression line to predict the life expectancy of men in 2020 and 2030.