

MTH 126
Exam 1
Spring 2025

Formulas are on the last page, which you may pull off.

Calculators are allowed. You may use a scientific calculator or a graphing calculator (e.g., TI-84) but not one with CAS (e.g., no TI-89, no TI-Nspire CAS). You may not use a phone app.

Show work to support each answer, to be eligible for full credit. Be neat and organized. Clearly indicate your answers.

100 points possible. 10 problems at 10 points each.

1. Simplify. Only positive exponents in your answer.

$$\left(\frac{2x^2y^{-3}}{x^{-4}y^{-1}}\right)^{-3}$$

2. Simplify.

$$\frac{x^2 - 2x - 3}{x^2 - 9} \div \frac{3x^2 + 2x - 1}{9x^2 - 1}$$

3. If $f(x) = 4x^2 - 3x$, find the following and simplify.

(a) $f(x + 1)$

(b) $f(x + h)$

4. Find the market equilibrium point for the given demand and supply functions.

Demand: $8p = -q + 78$

Supply: $4p - q = 21$

- 5.** Solve the equation using the quadratic formula. Give real answers
(a) exactly (this means leave the square root symbol in your answer)
and (b) rounded to two decimal places.

$$2x^2 - 8x = -3$$

- 6.** The profit function for a firm is $P(x) = 126x - 0.8x^2 - 1400$. Find the number of units at which maximum profit is achieved, and find the maximum profit.

7. Graph the exponential function.

Begin by substituting -2 , -1 , 0 , 1 , and 2 for x . Show your "T-chart" and graph.

$$f(x) = 6^{-x}$$

8. (a) Rewrite the expression as a sum or difference of two logarithmic functions containing no exponents or radicals.

$$\log_3 \left(x \sqrt{x + 25} \right)$$

(b) Rewrite the expression as a single logarithm.

$$6 \log_8(x + 10) + \frac{1}{5} \log_8(x)$$

9. The monthly sales of a product, in dollars, is given by $S(x) = 60,000e^{-0.7x}$, where x is the number of months after the end of an advertising campaign. How many months after the end of the campaign will monthly sales be \$500?

(Show the algebra to justify your answer. Round your answer to 3 decimal places.)

10. Suppose \$45,000 is invested for 10 months at an annual simple interest rate of 7%.

(a) How much interest will be earned?

(b) What is the future value of the investment after 10 months?