

# MTH 101 (Sample 1)

---

1. A product can be sold for \$29 per unit. The cost  $c$  of producing  $x$  units is  $c(x) = 24x + 5000$ .
  - (a) What is the revenue function?
  - (b) How many units must be sold for the company to break even?
  - (c) How many units must be sold for the company to have \$300 profit?
2. The management of a company that manufactured tables has fixed cost of \$275 per day and a total cost of \$4500 per day at a daily output of 75 tables.
  - (a) Assuming the total cost per day,  $C(x)$ , is linearly related to the total output  $x$  per day. Write an equation for the total cost.
  - (b) What is the total cost for an output of 32 tables?
  - (c) Graph the cost function.
3. XYZ Utilities uses the following rates to compute the monthly cost of natural gas for residential customers.

<b>\$0.7675 per CCF for the first 50 CCF</b>
<b>\$0.6400 per CCF for the next 150 CCF</b>
<b>\$0.6130 per CCF for all over 200 CCF</b>

  - (a) Write a piecewise function  $C(x)$  for the cost of consuming  $x$  CCF (cubic hundred feet) of natural gas.
  - (b) How much does it cost for a family consumed 215 CCF.
  - (c) Graph the function  $C(x)$ .
4. A car salesperson tells you that you can buy the car you are looking at for 3,000 down and \$200 a month for 48 months. If interest is 9% compounded monthly.
  - (a) what is the original price of the car?
  - (b) How much interest will you pay during the 48 months?
5. Rayan took out a 30-year mortgage for \$160,000 at 9.8% interest, compounded monthly. After he made 12 years of payments he decided to refinance the remaining loan for 25 years at 7.2% interest, compounded monthly. What will be the balance on their loan 5 years after they refinance?

6. A small resort must add a swimming pool to compete with a new resort built nearby. The pool will cost \$28,000. The resort borrows the money and agrees to repay it with equal payments at the end of each quarter for  $6\frac{1}{2}$  years at interest rate of 6%, compounded quarterly. Find the amount of each payment.
  
7. A firm of attorneys deposits \$500 of profit sharing money at the end of each semiannual period for  $7\frac{1}{2}$  years with an interest rate of 5%, compounded semiannually.
  - (a) Find the final amount in the account.
  - (b) Find the amount of interest earned.
  
8. An individual wants to establish an annuity for retirement purposes. He wants to make quarterly deposits for 20 years so that he can then make quarterly withdrawals of \$5000 for 10 years. The annuity earns 12% interest compounded quarterly.
  - (a) How much will have to be in the account at the time he retires?
  - (b) How much should be deposited each quarter for 20 years in order to accumulate the required amount?
  - (c) What is the total amount of interest earned during the 30 years period?
  
9. You have some money. Bank I gives 6% interest compounded 6 times a year. Bank II gives 6.1% compounded semi-annually. Which bank would you choose?
  
10. A small business borrows \$50,000 for expansion at 12% compounded monthly. The loan is due in 4 years
  - (a) Find the value of the loan after 4 years.
  - (b) How much interest will the business pay?
  
11. In order to save enough money for the down payment on a condominium, a young couple deposits \$200 each month into an account that pays 7.02% interest compounded monthly. If they need \$10,000 for a down payment.
  - (a) How many deposits will they have to make?
  - (b) How much interest will be paid?
  
12. A man deposits \$2,000 in an account on his 21st birthday and on each subsequent birthday up to, and including his 29th birthday (9 deposits in all). The account earns 8% compounded annually. If he then leaves the money in the account without any more deposits, how much will he have on his 65th birthday, assuming the account continues to earn the same rate of interest?

13. The manager of a large apartment complex has found that the profit is given by the following function  $p(x) = -x^2 + 250x - 15000$ , where  $x$  is the number of units rented.
- For what value of  $x$  does the complex produce the maximum profit?
  - What is the maximum profit?
  - Graph the profit function.
14. If you borrow \$4000 from a lending firm for the purchase of a computer and agree to repay it in 48 equal installments at 0.9% interest per month on the unpaid balance.
- How much are the monthly payments.
  - How much total interest will be paid.

15. Suppose that the revenue and cost functions for a small business are

$$\begin{aligned} R(x) &= x(70 - x), \text{ and} \\ C(x) &= 20x, \text{ where } 0 \leq x \leq 70. \end{aligned}$$

- Find the break-even point(s).
  - Find the maximum revenue.
  - Sketch the graph of  $R(x)$  and  $C(x)$  on the same coordinates showing the intercepts and the vertex (for  $R(x)$ ). Indicate the regions of loss and profit.
16. How long will it take 10,000 to double if it is invested at 6.5% compounded monthly?
17. Suppose \$600 is deposited each quarter into an account paying 8% compounded quarterly.
- Find the value of the account after 4 years.
  - Find the value of the account after 3 years.
  - Find the interest earned during the fourth year.
18. If you paid \$45 to a loan company for the use of \$1200 for 90 days, what simple annual rate of interest did they charge?
19. How long will it take \$5,000 to grow to \$1,100 if it invested at 11% compounded quarterly?
20. What is the annual nominal rate compounded monthly for a CD that has an annual percentage yield of 6.4%?
21. Suppose \$5000 is invested into account for 18 months. Find the value of the account after the 18 months if the interest rate is 6%

- (a) Simple interest
  - (b) Compounded annually
  - (c) Compounded continuously
22. At a price of \$2 per unit of a certain product, the demand is 21 thousand units and when the price rises to \$5 per unit the demand decreases to 12 thousand units.
- (a) Assuming the price-demand relationship is linear, find an equation for this relationship.
  - (b) If the price-supply equation is given by  $p = 0.208x + 2.5$  where  $x$  is the number of items produced in thousand units, find the equilibrium point.
  - (c) Graph the price-demand and price-supply equations in the same coordinate system. Clearly mark the equilibrium point on the graph.
23. Suppose that the revenue and cost functions for a small business are

$$R(x) = x(60 - x), \text{ and}$$

$$C(x) = 15x, \text{ where } 0 \leq x \leq 60.$$

- (a) Find the break-even point(s).
  - (b) Find the maximum revenue.
  - (c) Sketch the graph of  $R(x)$  and  $C(x)$  on the same coordinates showing the intercepts and the vertex (for  $R(x)$ ). Indicate the regions of loss and profit.
24. Lina borrows \$7000 at 8% interest rate compounded monthly and plans to amortize the loan over 5 years in equal monthly payments:
- (a) What is Lina's monthly payment?
  - (b) How much interest will Lina pay?