

# MATH 131 Semester 131. Exam 1

Name: \_\_\_\_\_

Id #: \_\_\_\_\_

Serial #: \_\_\_\_\_

- **Time Allowed:** 120 minutes
- All working must be shown.
- Points will be deducted for unreadable writing or incomplete answers.
- This exam has **8** questions.

Question	Score
1. (12 points)	
2. (12 points)	
3. (15 points)	
4. (12 points)	
5. (12 points)	
6. (15 points)	
7. (10 points)	
8. (12 points)	
Total (100 points)	

1. A university carpark is rectangular in shape and has sides measuring 10m and 8m. The university wants to double the area of the carpark by adding a uniform strip on all four sides of the carpark. The new carpark will also be rectangular. What will be the dimensions of the new carpark?

2. A company has a bonus plan for its salespeople. For every unit sold by a salesperson, the person receives 200 SAR. The bonus increases by 3 SAR for every unit sold over 100. For example, if a salesperson sells 103 units the salesperson receives 209 SAR for each unit sold. And so receives  $103 \times 209 = 21,527$  SAR.

Let  $x$  represent the number of units sold and  $b$  the size of the bonus.

(a) Write down an equation for  $b$  in terms of  $x$ , if  $x \leq 100$ .

(b) Write down an equation for  $b$  in terms of  $x$ , if  $x \geq 100$ .

(c) How many units are sold if the salesperson receives 25,863 SAR as a bonus?

3. Solve the inequalities:

(a)  $-2(x + 1) > 3x - 2$

(b)  $\frac{1}{x-1} > 2$

(c)  $2(2 - x) \leq 5(x + 1)$

4. Let  $L$  be the line that passes through the points  $(1, 1)$  and  $(3, -2)$ .

(a) Find the equation of  $L$ .

(b) Find the equation of the line through the point  $(2, 3)$  that is parallel to  $L$ .

(c) Find the equation of the line through the point  $(2, 3)$  that is perpendicular to  $L$ .

5. Solve the following system of equations by the method of elimination.

$$\begin{cases} 2y + 3x - z &= 5 \\ -z - y + x &= 3 \\ x + y + z &= -1 \end{cases}$$

6. A paint company calculates that the demand equation and supply equation for its paint are respectively

$$p = -\frac{1}{50}q + 23 \quad \text{and} \quad p = \frac{1}{100}q + 8,$$

where  $p$  is price in dollars and  $q$  is quantity in litres.

- (a) What is the equilibrium price, quantity, and revenue?
- (b) If the fixed costs for its product is \$3,000, and the variable cost \$5 per litre, how much profit or loss do you expect the company to make on its production (assuming equilibrium revenue)?
- (c) If producing the paint has a fixed cost of \$3,000, what is the highest variable cost per litre that will ensure the company makes a profit at equilibrium?

7. Solve the nonlinear system of equations:

$$\begin{cases} 1 - y = \sqrt{1 + x}, \\ x + y = 3x + 1. \end{cases}$$

8. An American company has \$500,000 of taxable income. Both the Federal government and State government will tax the income. The Federal tax is 35% of the money left after the State tax has been paid. The State tax is 20% of the money left after the Federal tax has been paid.

(a) Define relevant variables and write down a system of equations modelling this situation.

(b) Solve the system to calculate the total amount of tax paid by the company.