PART ONE: *Answer all 30 questions by circling the correct answer:*
(75%)

1. $R = 48x - 2x^2$ where R is the total revenue in dinars, and x is the output. At what output is total revenue a maximum?

a) 12 b) 48
c) 2 d) 4

2. What price will be charged for the output which maximizes total revenue in question (1):

a) 24 dinars b) 4 dinars
c) 12 dinars d) 48 dinars

3. If a demand curve is $p = 40 - 0.1q$, and demand increases by 30 at each price level, then the equation of the new demand curve is:

a) $p = 70 - 0.1q$ b) $p - 0.1q = 43$
c) $p + 0.1q = 43$ d) $p = 37 - 0.1q$

4. A firm plans to sell at prices which are 45% markup on retail. If the firm sells x dinars and the firm gives commission of 20 piasters for every dinar of sales, then the variable cost is:

a) 0.75x b) 0.2x
c) 0.55x d) 0.65x

PART TWO The break-even point of the cost-sales equation $y = 0.6x + 120$ is:

a) 120
b) 300
c) 200
d) 450

$\frac{120}{1-0,6}$

$\frac{120}{0,4}$

6. The equation $(2x + 3)(3x - 1) = 6$ has a:

a) no solutions
b) one solution
c) two solutions
d) three solutions

$6x^2 - 2x + 3x - 3$

$6x + x - 3$

$a = 6 \quad b = 1 \quad c = -3$

$1 - 4(6)(-3)$

$\sqrt{} = 5,2 - 5,3$

7. If the total cost of producing x units is $C(x) = 3^{0.2x} + \log(5x + 100) + 8$ dinars, then the fixed costs are:

a) 8 dinars
b) 11 dinars
c) log5 dinars
d) $3^{0.2}$ dinars

$C(0) = 3^{0,2(0)} + \log(5(0) + 100) + 8$

$1 + \log(100) - 3$

$1 + 2 + 8 = 11$

8. The vertex of the parabola $y = x^2 + 4x + 8$ is:

a) (–2,4)
b) (2,20)
c) (–2,8)
d) (2,8)

$a = 1 \quad b = 4 \quad c = 8$

$\frac{-4}{2} = (-2,)$

$4 + (-2) + 8$

$= 4$

9. If the relationship between total cost y piasters and number of units made x is linear, and if cost increases by 20 piasters for each additional unit made, and total cost of 10 units is 30 dinars, the equation of cost-output relationship is:

a) $y = 20x - 170$
b) $y = 20x + 2800$
c) $y = 0.2x + 28$
d) $y = 0.2x + 2998$

$20x + 30$

10. The inverse of $\begin{pmatrix} 2 & 3 \\ 1 & 4 \end{pmatrix}$ is:

a) $\begin{pmatrix} 0.8 & -0.6 \\ -0.2 & 0.4 \end{pmatrix}$

b) $\begin{pmatrix} 0.8 & -0.6 \\ 0.2 & -0.4 \end{pmatrix}$

c) $\begin{pmatrix} 0.8 & 0.6 \\ 0.2 & 0.4 \end{pmatrix}$

d) $\begin{pmatrix} -0.8 & 0.6 \\ -0.2 & 0.4 \end{pmatrix}$

11. The equation of the line that passes through **(5,0)** and **(5,1)** is:

a) $y - 6x = 5$
c) $x - 5 = 0$
b) $y - 5 = 0$
d) $x + 5 = 0$

12. The system of equations: $\mathbf{y - x - 1 = 0}$ and $\mathbf{4x - 2y = 2}$ has:

a) no solutions
c) solution = (2,3)
b) solution = (0,1)
d) solution = (0.5,1.5)

13. If the demand curve is $\mathbf{p = 40 - 0.1q}$ and the supply curve is $\mathbf{5p - q = 50}$, the equilibrium point is:

c) (30,100)
b) (100,30)
c) (30,30)
d) (100,100)

14. Suppose the economy of a country has an *Oil* industry and an *Agricultural* industry, with technological matrix:

$$T = \begin{matrix} \\ Oil \\ Agricultural \end{matrix} \begin{matrix} O & A \\ \begin{pmatrix} 0.5 & 0.5 \\ 0.2 & 0.6 \end{pmatrix} \end{matrix}$$

If a surplus (external demand) of 300 units of *Oil* products and 200 units of *Agricultural* products are desired, then the gross production (output) of the *Agricultural* industry is:

a) 2300 b) 2200
c) 1900 d) 1600

15. How much does the *Oil* industry take from the *Agricultural* industry (from question 14)?

a) 320 b) 440
c) 800 d) 1100

16. If $\log(4x) - \log(x+1) = 1$, then $x =$

a) –3/5 b) 1/9
c) –2 d) –5/3

17. If $g(x) = (3x^2+1)^4$, then $g'(x) =$

a) $24x(3x^2+1)^3$ b) $4(6x)^3$
c) $4(3x^2+1)^3$ d) $12x(3x^2+1)^3$

18. If $y = \log e^x$, then $y' =$

a) 0
b) $1 / \ln 10$
c) $1 / \log e$
d) $x / \ln 10$

19. The slope of the tangent line to the curve $f(x) = 2x^3 - 6x + 1$ at $x = -1$ is:

a) 0
b) 5
c) -12
d) -3

20. $g(x) = 8 + 2x^3 - 6x$ has an minimum point at:

a) $x = -3$
b) $x = 3$
c) $x = 1$
d) $x = -1$

21. If $f = e^{2x+y}$, then $f_y =$

a) e^2
b) e^{2x+y}
c) $2e^{2x+y}$
d) e^{2+y}

22. The equation of the tangent line to the curve $f(x) = x + e^{2x} + 1$ at $x = 0$ is:

a) $y = 2x$
b) $y = 2$
c) $y = 3x + 2$
d) $y = 3x$

23. If $f(x,y) = xe^y + ye^x$, then $f_{xy} =$

a) $e^y + e^x$
b) $e^y + ye^x$
c) e^{x+y}
d) ye^x

24. If $g(x,y) = x/y$, then $g_y =$

a) $1/y^2$
b) $-1/y$
c) x/y^2
d) $-x/y^2$

25. If $2x^2 + 2y - 4 = 0$, then $y' =$

a) $2x$
b) $-2x$
c) $4x + 2$
d) $4x$

26. The cost-sales equation is $y = 0.8x + 45$. If variable costs other than the cost of goods were 12% of sales, then the mark-up is:

a) 33%
b) 32%
c) 68%
d) 43%

27. If 1 dinar is deposited at 12% interest compounded quarterly, what will be the amount after 2 years and 3 months?

a) $(1.12)^{2.25}$ dinars
b) $(1.04)^{9}$ dinars
c) $(1.03)^{9}$ dinars
d) $(1.01)^{27}$ dinars

28. The function $f(x,y) = 2x^2 + 4x + 6y^2 - 24y - 20$ has a:

a) maximum when $x = -1$ and $y = 2$
b) minimum when $x = -1$ and $y = 2$
c) minimum when $x = 0$ and $y = 0$
d) no maximum and no minimum

29. If $5^{2x} = 15$, then $x =$

a) $\frac{1}{2} \ln 5$
b) $\frac{1}{2} \ln 3$
c) $\frac{1}{2} (1 + \log_5 3)$
d) $\frac{1}{2} (1 + \log_3 5)$

30. The steady state vector for the transition matrix $\begin{pmatrix} 0.7 & 0.3 \\ 0.2 & 0.8 \end{pmatrix}$ is:

a) (0.3 0.7)
b) (0.6 0.4)
c) (0.4 0.6)
d) (0.8 0.2)

PART TWO: *Answer all TWO questions... Explain every step...Show all your work on this paper.*

I (13%). The cost of making a car is two thousands dinars per car, and the fixed costs are three thousands dinars. The demand for the product at a price p thousands dinars per car is given by: $x = 20 - 5p$

a) Find the cost, revenue, and profit functions.

$p = \frac{20-x}{5}$

$C(x) = 2000x + 3000$ 2

$R(x) = x(p)$

$R: \quad x = 20 - 5p$

$x - 20 = -5p \Longrightarrow p = -\frac{1}{5}x + 4$

$R(x) = x\left(-\frac{x}{5} + 4x\right) \Longrightarrow -\frac{x^2}{5} + 4x$

$P = Rx - C(x) \Longrightarrow -\frac{x^2}{5} + 4x - 2000x + 3000$ 1

$-\frac{1}{5}x = -4 + p$

$-\frac{1}{5}x + 4 = p$ 2

b) Find the maximum profit?

$a = -\frac{1}{5} \quad b = -1496 \quad -\frac{x^2}{5} - 1496x + 3000$

$\frac{+1996}{-\frac{1}{5}} = -1996 = -9980$

$+\frac{(-9980)^2}{5} - 1996(-9980) + 3000$

-49804

$(-9980, 6149150961$

c) What unit price should be charged to get the maximum profit?

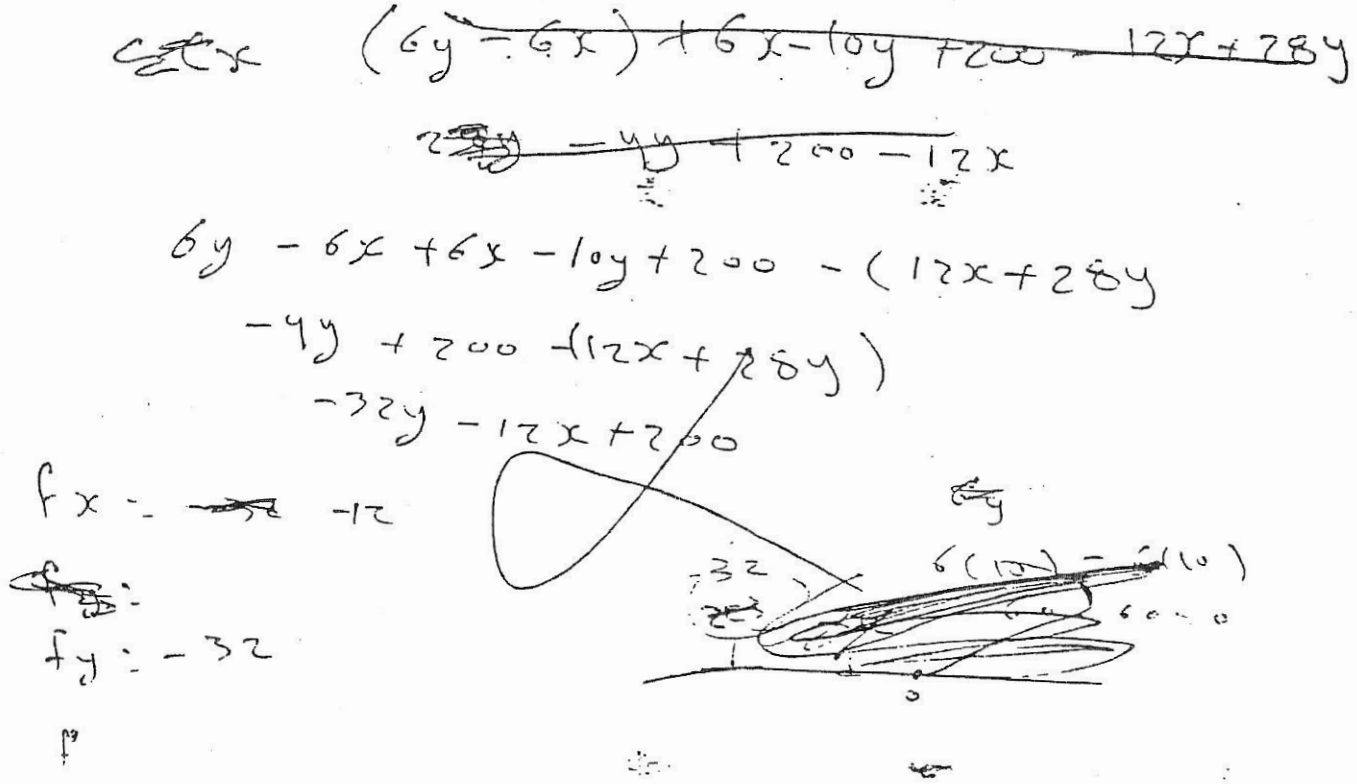
$(1996) - 4\left(-\frac{1}{5}\right)(3000$

-1996

$2\left(-\frac{1}{5}\right)$

II (12%). A bakery makes bread in two sizes: small and medium. The cost in dinars of producing x pieces of the small size and y pieces of the medium size is given by: $C(x,y) = 12x + 28y$.
The demands for the two sizes are: $p_1 = 6y - 6x$
$p_2 = 6x - 10y + 200$
where p_1 is the price in dinars per piece for the small size, and p_2 is the price in dinars per piece for the medium size.

a) Determine how many pieces of each size the bakery should make to maximize profit.



b) What is the maximum profit?