

Math1090 Final Exam
Spring, 2005

Name _____

Instructions:

- (e) Show all work as partial credit will be given where appropriate.
- (a) If no work is shown, there may be no credit given.
- (a) All final answers should be written in the space provided and in simplified form.

Grade:

1	
2	
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12	

Total

1) (25 points) Given the matrices A, B, C and D, perform the indicated operations or state that it's not possible.

$$A = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} \quad B = \begin{bmatrix} 1 & 0 & 7 \\ 3 & -4 & 2 \end{bmatrix} \quad C = \begin{bmatrix} 1 & 5 & -7 & 1 \\ -1 & 6 & 2 & -4 \end{bmatrix}$$

$$D = \begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}$$

(a) AB

Answer 1a: _____

(b) $2A - 3D$

Answer 1b: _____

(c) D^{-1}

Answer 1c: _____

(d) C^T

Answer 1d: _____

(e) $A+B$

Answer 1e: _____

2) (10 points) Solve the following linear system of equations, if possible.

$$\begin{aligned} 3x - 2y + z &= 2 \\ x - y + z &= 2 \\ 5x + 10y - 5z &= 10 \end{aligned}$$

$$x = \underline{\hspace{2cm}}$$

$$y = \underline{\hspace{2cm}}$$

$$z = \underline{\hspace{2cm}}$$

3) (10 points) John makes a \$1000 contribution at the end of each quarter to a retirement account for 10 years earning 7% interest. After that, he makes no additional contributions and no withdrawals, and he leaves the money in the account for another 10 years.

(a) How much money is in the account after the 10 years of contributions?

Answer 3a: _____

(b) How much money is in the account at the end of 20 years?

Answer 3b: _____

4) (15 points) For $f(x)=\sqrt{x-2}$ and $g(x)=x^2+1$
State the domain for both functions.

Domain for $f(x)$ _____

Domain for $g(x)$ _____

Find $(f+g)(5)$.

$(f+g)(5) =$ _____

Find $(f \circ g)(x)$.

$(f \circ g)(x) =$ _____

5) (10 points) Solve the equation.

$$\frac{3x}{x-2} + \frac{1}{2} = \frac{3}{10} + \frac{6}{x-2}$$

$x =$ _____

6) (10 points) Find the equation of the line parallel to $y=-2x+1$ and passing through the point $(-1, 5)$.

Answer 6: _____

7) (10 points) Angela buys a car. After a down payment, she still owes \$20,000. She sets up a 5-year loan with monthly payments due at the end of each month with an interest rate of 6%.

(a) How much will each monthly payment be?

Answer 7a: \$ _____

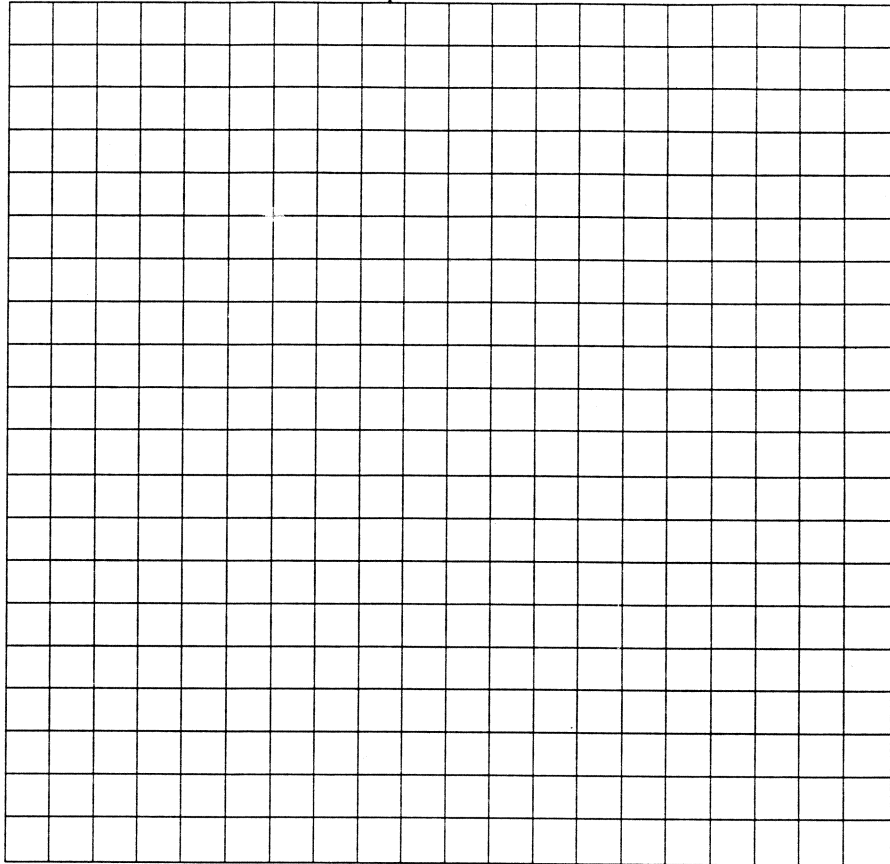
(b) If Angela decides to pay off the loan after 3 years, how much money should she pay then?

Answer 7b: \$ _____

8) (10 points) For the following system of inequalities

$$\begin{aligned}x+3y &\leq 9 \\ 2x+2y &\leq 10 \\ x &\geq 0 \\ y &\geq 0\end{aligned}$$

(a) Sketch and shade in the solution region defined by the inequalities.



(b) Find the maximum of the objective function $f(x, y) = 2x + y$ subjected to the above constraints.

Maximum value: _____ at point _____

9) (20 points) The total costs for a company to produce and sell x units of a product are given by $C(x) = 500 + 50x + x^2$ (in dollars). The sale price for one item is \$250.

(a) Find the revenue function, $R(x)$.

$$R(x) = \underline{\hspace{10em}}$$

(b) Find the profit function, $P(x)$.

$$P(x) = \underline{\hspace{10em}}$$

(c) Find the break-even point(s).

$$\text{Break-even point(s): } \underline{\hspace{10em}}$$

(d) Find the number of items sold to get the maximum profit.

$$x = \underline{\hspace{10em}}$$

10) (15 points) The population of Mathville was 12,000 in 1960 and 21,000 in 1980. The population growth of the city follows the formula

$$P(t) = P_0 e^{ht}$$

where t is the number of years after 1960.

(a) Determine P_0 and h .

$$P_0 = \underline{\hspace{10em}}$$

$$h = \underline{\hspace{10em}}$$

(b) Estimate the population of Mathville in the year 2000.

$$\text{Population} = \underline{\hspace{10em}}$$

(c) How many years after 1960 will the population grow to be 34,000?

$$\underline{\hspace{10em}} \text{ years}$$

11) (20 points) Let $y = x^2 + 4x + 3$.

(a) Find the vertex of the parabola.

Vertex _____

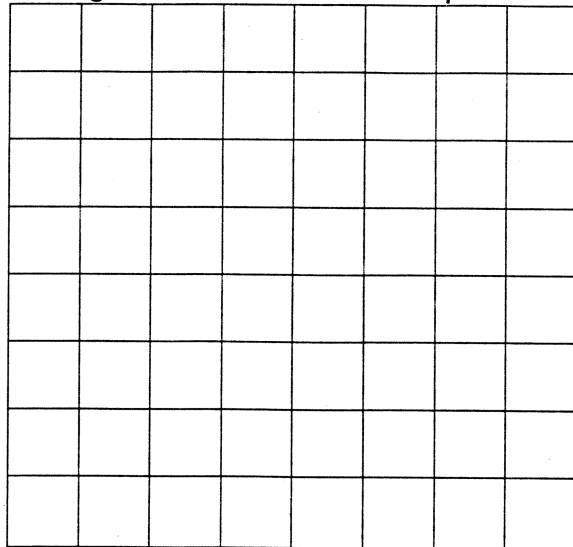
(b) Tell if it's a minimum or maximum point.

Minimum or Maximum (circle one)

(c) Solve $y = 0$ to find the x-intercepts, if there are any.

x-intercepts: _____

(d) Sketch the graph, showing the vertex and x-intercepts.



12) (10 points) Solve for the exact value of x .

$$\log_3(x-2) + \log_3 5 = 3$$

$x =$ _____