

Math1090 Final Exam  
Spring, 2009

Name \_\_\_\_\_

Instructions:

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

DO NOT WRITE IN THIS TABLE!!!  
(It is for grading purposes.)

Grade:

1	
2	
3	
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12	

Raw Total (out of 110 points)

Total (percentage)

1) (4 pts each part) If  $f(x)=2x^2$  and  $g(x)=\sqrt{x-1}$ , find each of the following, simplifying as far as possible:  
(a) Domain of  $f(x)$  and  $g(x)$ .

Domain of  $f(x)$ : \_\_\_\_\_

Domain of  $g(x)$ : \_\_\_\_\_

(b)  $g(5)$

(c)  $f(x)g(x)$   $g(5) =$  \_\_\_\_\_

$f(x)g(x) =$  \_\_\_\_\_

**(Note: This is #1 continued!)**

$$f(x) = 2x^2 \quad \text{and} \quad g(x) = \sqrt{x-1}$$

(d)  $(f \circ g)(x)$

(e)  $g^{-1}(x)$

$$(f \circ g)(x) = \underline{\hspace{10cm}}$$

$$g^{-1}(x) = \underline{\hspace{10cm}}$$

2) (4 pts) Find the equation of the line through the point (2, 3) that is perpendicular to the line  $x = 4y - 8$ . (Give answer in slope-intercept form.)

line: \_\_\_\_\_

3) (4 pts each part) Solve the following equation and inequality. (Give exact answers.)

(a)  $\frac{x}{4x-8} = 3 - \frac{2}{x-2}$

x = \_\_\_\_\_

3. (b)  $-x+5 \geq \frac{x+1}{3}$

Answer: \_\_\_\_\_

4) (6 pts) The profit function for a firm making widgets is  $P(x) = 88x - x^2 - 1200$

(a) Find the number of units at which maximum profit is achieved.

# units: \_\_\_\_\_

(b) Find the maximum profit.

Maximum profit: \_\_\_\_\_

5) (6 pts) Solve this system of equations using any method.

$$x + 2y + z = 0$$

$$x + y + 2z = 2$$

$$-2x - 2y + z = 1$$

solution: \_\_\_\_\_

6) (4 pts each) Given the matrices A, B, C and D, compute the following, if possible. If it's not possible, state the reason why.

$$A = \begin{bmatrix} 3 & 2 \\ 0 & 1 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 4 & 2 \end{bmatrix}, \quad C = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 2 \\ 2 & 2 & 5 \end{bmatrix} \quad \text{and} \quad D = \begin{bmatrix} -1 & 3 & 4 \\ 5 & 7 & -2 \end{bmatrix}.$$

(a)  $AB$

(b)  $A^{-1}$

$$AB = \underline{\hspace{10cm}}$$

$$A^{-1} = \underline{\hspace{10cm}}$$

(Note: This is #6 continued.)

$$A = \begin{bmatrix} 3 & 2 \\ 0 & 1 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 4 & 2 \end{bmatrix}, \quad C = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 2 \\ 2 & 2 & 5 \end{bmatrix} \text{ and } D = \begin{bmatrix} -1 & 3 & 4 \\ 5 & 7 & -2 \end{bmatrix}.$$

(c)  $BA$

$$BA = \underline{\hspace{10cm}}$$

(d)  $3B-2D$

$$3B-2D = \underline{\hspace{10cm}}$$

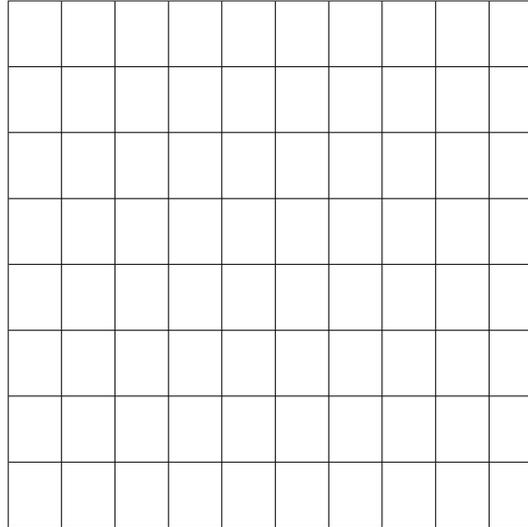
7) (8 pts) Maximize the function  $f = x + 2y$  subject to the constraints

$$x + y \geq 4$$

$$2x + y \leq 8$$

$$y \leq 4$$

(a) Shade in the solution region.



(b) Find the vertices (a.k.a. corners) of the solution region.

Vertices (or corners): \_\_\_\_\_

(c) What is the maximum value of  $f$ ?

Max value: \_\_\_\_\_

(d) At what vertex (corner) does the maximum value of  $f$  occur? \_\_\_\_\_

vertex (corner) for max  $f$  value: \_\_\_\_\_

8) (4 pts each part) Solve for  $x$ . (Show all work without a calculator.)

(a)  $\log_6 x = 1 - \log_6(x+1)$

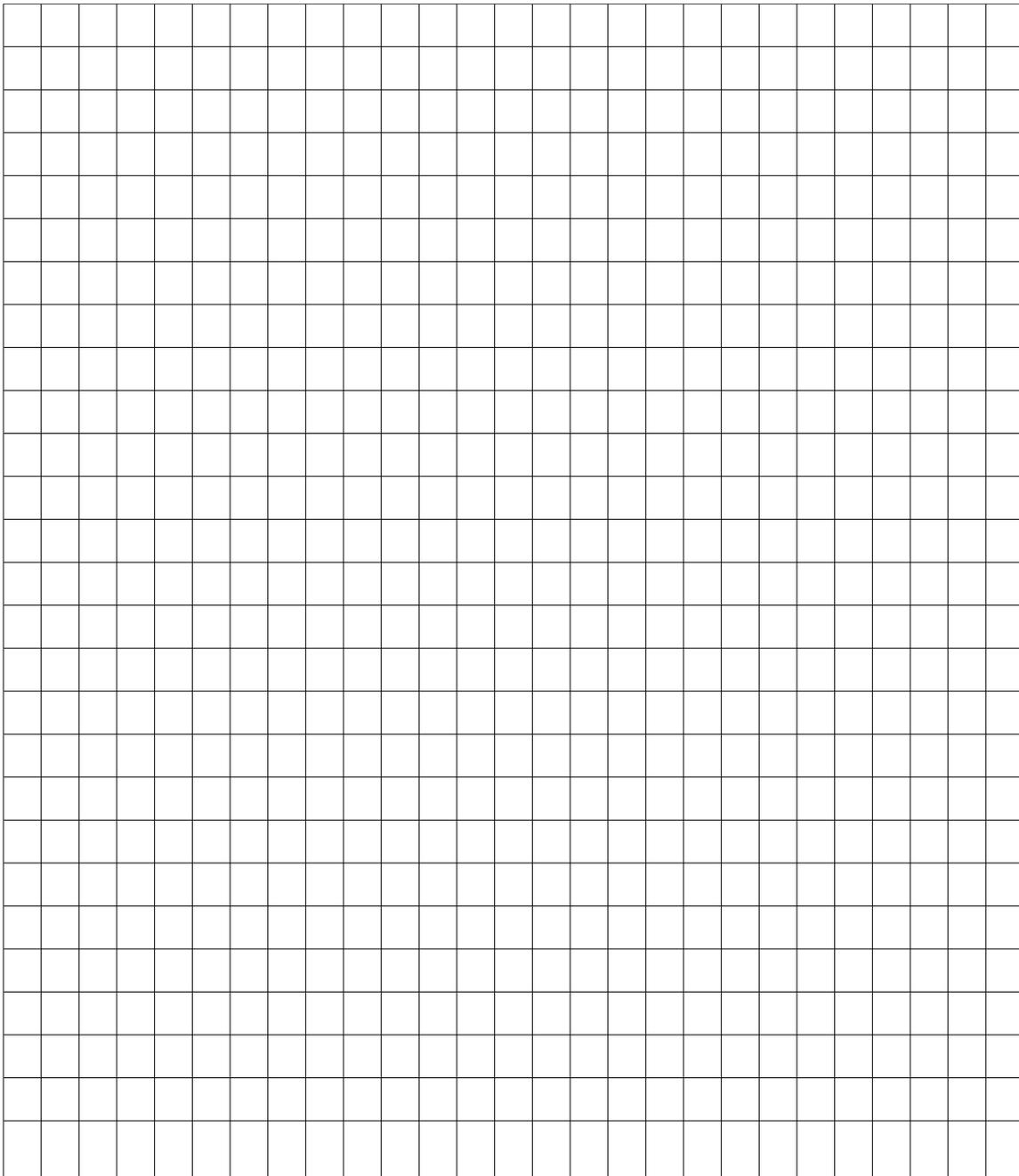
(b)  $2(3^{2x}) + 100 = 200$

$x =$  \_\_\_\_\_

$x =$  \_\_\_\_\_

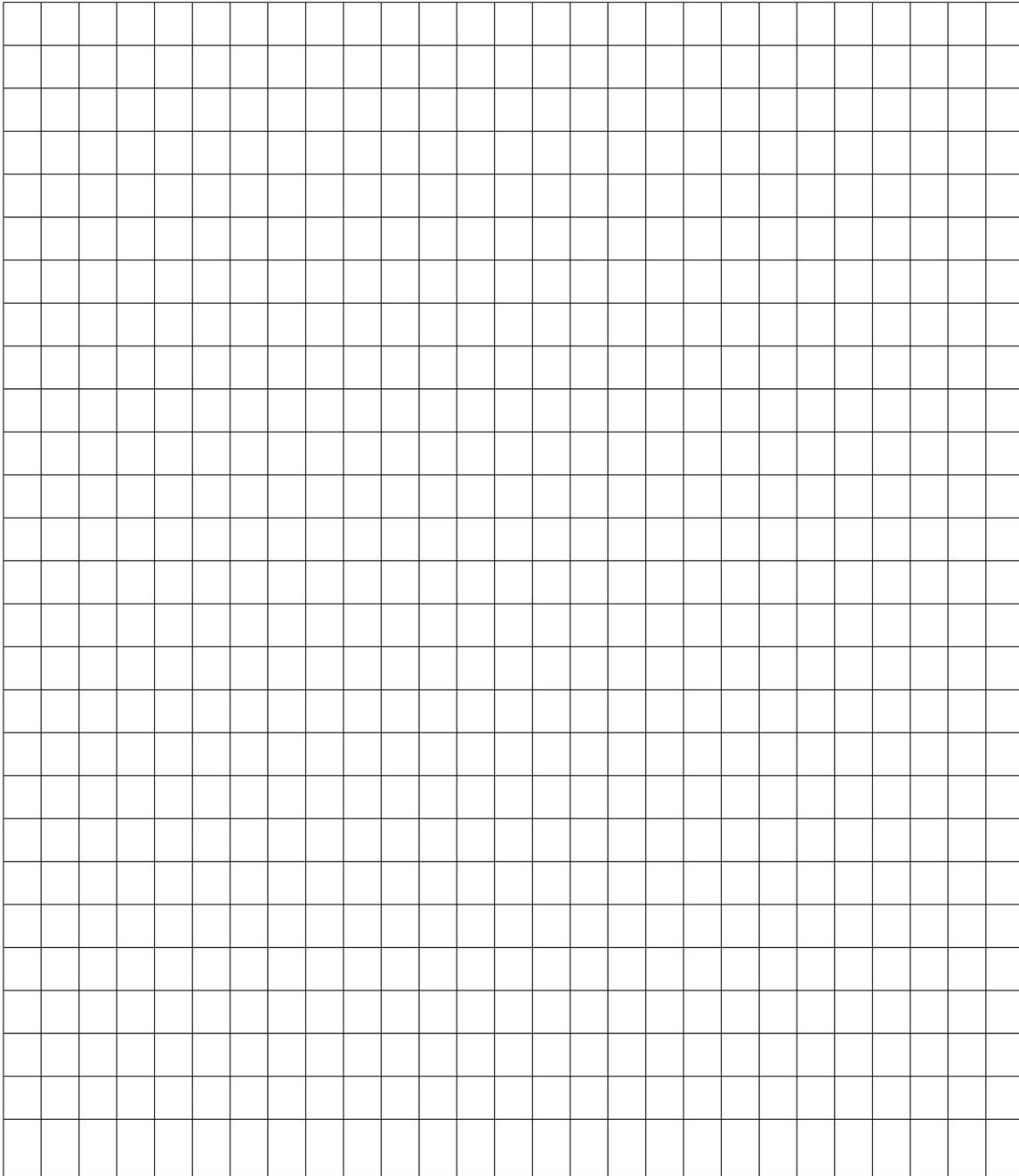
9) (4 pts each part) Sketch the graph of the given functions in the xy-plane. Clearly label (1) two points on each graph and (2) any asymptotes.

(a)  $y = 4^{-x}$



(#9 instructions: Sketch the graph of the given function in the xy-plane. Clearly label (1) two points on each graph and (2) any asymptotes.)

(b)  $y = \log(x + 2)$



10) (8 pts) Let  $y = -x^2 + 4x + 5$  be the equation of a parabola.  
(a) Find the coordinates of the vertex.

(b) Find the x-intercept(s), if any.

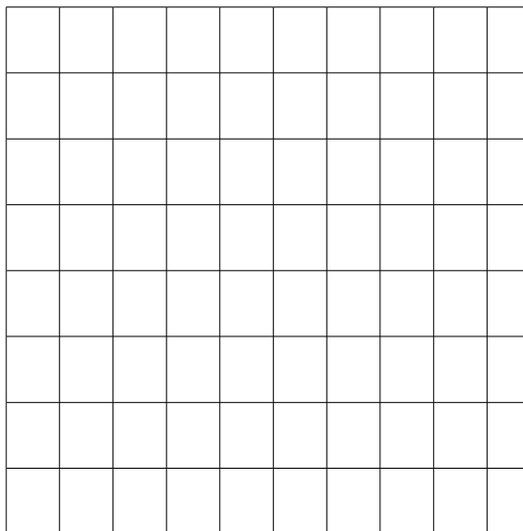
Vertex: \_\_\_\_\_

(c) Find the y-intercept.

x-intercept(s): \_\_\_\_\_

(d) Sketch the graph.

Y-intercept: \_\_\_\_\_



11) (8 pts) Dave buys a house for \$300,000. He makes a \$50,000 down payment and agrees to amortize the rest of the debt with quarterly payments over the next ten years. The interest on the debt is 6% compounded quarterly.  
(a) What are his quarterly payments?

Quarterly payments: \_\_\_\_\_  
(b) Find the total amount of his payments.

Total paid: \_\_\_\_\_  
(c) Find the total amount of interest paid on this loan.

Total Interest paid: \_\_\_\_\_

12) (5 pts each part) (a) Sarah graduates college at the age of 25 and gets a job earning \$45,000 per year. She decides to invest \$5,000 at the end of each quarter, in an account yielding 8% interest compounded quarterly. She does this for 10 years. If after that she makes no deposits or withdrawals, but leaves the money in the account, how much money does she have when she is 65 years old?

Total for Sarah: \_\_\_\_\_

(b) Sarah's twin sister, Jessica, wins a prize of \$5,000 in a contest at age 25. She puts this in an account yielding 8% interest compounded quarterly. If she also makes no withdrawals or deposits, but leaves the money in the account, how much money does she have when she is 65 years old?

Total for Jessica: \_\_\_\_\_