

Name: _____

UnID: _____ Instructor: _____

Instructions:

- Please show all of your work as partial credit will be given where appropriate, **and** there may be no credit given for problems where there is no work shown.
- All answers should be completely simplified, unless otherwise stated.
- Make sure all cell phones (and all other electronics that can connect to the internet) are put away and out of sight. If you have a cell phone/other electronic device out at any point, for any reason, you will receive a zero on this exam.
- You may use a scientific calculator only. No graphing or programmable calculators allowed.
- You will be given an opportunity to ask clarifying questions about the instructions within the first fifteen minutes of the time the scheduled final exam is advertised by the University to begin. The questions will be answered for the entire class. After that, no further questions will be allowed, for any reason.
- You must show us your U of U student ID card when finished with the exam.
- You can ask the proctor/instructor for scratch paper. You may use **no** other scratch paper. Please transfer all finished work onto the proper page in the test for us to grade there. We will **not** grade the work on the scratch pages.
- You are allowed to use one 8.5×11 inch sheet of paper (front and back) for your reference during the exam.

DO NOT WRITE BELOW THIS LINE. THE TABLE IS FOR GRADING.

Question	Points	Score	Question	Points	Score
1	10		8	15	
2	12		9	18	
3	20		10	15	
4	15		11	15	
5	20		12	15	
6	10		13	15	
7	15		14	15	
			Total	210	

1. 10 points If three less than two times a number is equal to six more than the number, then what is the number?

Answer: _____

2. 12 points Find the equation of the line passing through the points $(0, 1)$ and $(1, 3)$.

Line: _____

(put your answer in the form $y = mx + b$)

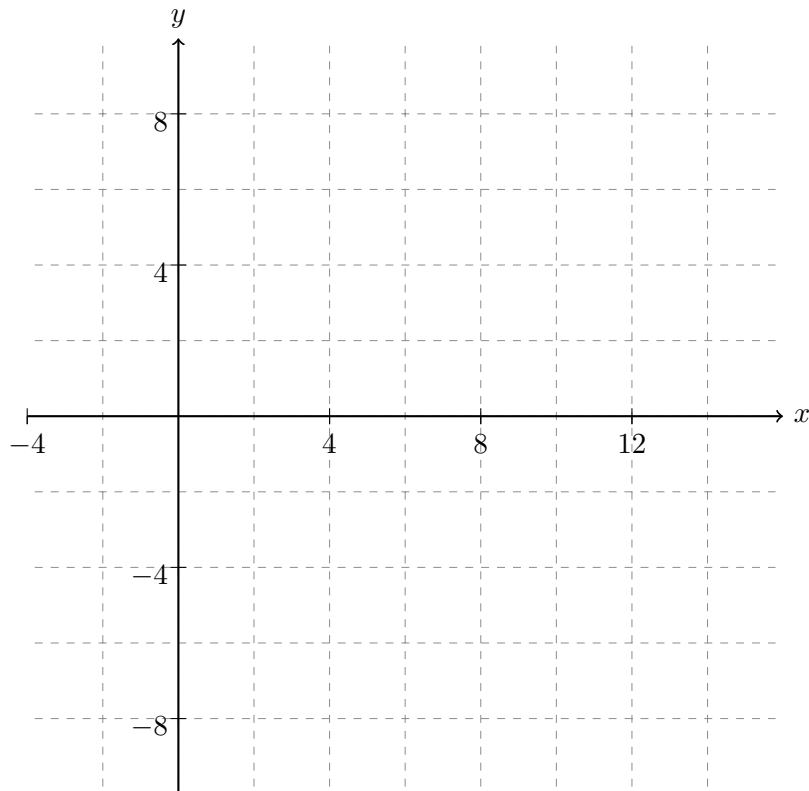
3. 20 points Consider the following system of inequalities:

$$y \leq -2x + 7$$

$$y \geq x - 5$$

$$x \geq 0$$

- (a) Graph the solution set and label the corner points with coordinates.



- (b) Calculate the maximum and minimum of the objective function $P = 2x - 3y$ given the constraints above.

Maximum: _____ **Located at:** _____

Minimum: _____ **Located at:** _____

4. 15 points Solve the following system of equations using any method.

$$x + 2y + 3z = 3$$

$$y + 4z = 11$$

$$5x + 6y = -25$$

$(x, y, z) =$ _____

5. 20 points Consider the matrices:

$$A = \begin{bmatrix} 7 & 10 \\ 5 & 6 \end{bmatrix}, \quad B = \begin{bmatrix} 4 & 9 \\ 7 & -2 \\ -5 & 6 \end{bmatrix}, \quad C = \begin{bmatrix} 1 & 2 \\ 0 & -1 \end{bmatrix}$$

Calculate all of the following matrices. If a computation is impossible, state that and the reason why.

- (a) Calculate B^T .

$$B^T = \underline{\hspace{15cm}}$$

- (b) Calculate $3C - A$.

$$3C - A = \underline{\hspace{15cm}}$$

- (c) Calculate A^{-1} .

$$A^{-1} = \underline{\hspace{15cm}}$$

- (d) Calculate AC .

$$AC = \underline{\hspace{15cm}}$$

6. 10 points The supply equation for a product is given by $p = 2q^2 - 24q + 4$ and the demand equation is given by $p = -8q + 100$.

(a) If the price increases, will consumers demand more or less product? Circle your answer.

More

Less

(b) Find the market equilibrium.

$p =$ _____ $q =$ _____

7. 15 points An auto repair shop sells car repair services. Suppose that the shop has monthly fixed costs of \$100 dollars and variable costs of $x + 20$ dollars per service, where x is the total number of services sold. The revenue function is $R(x) = (60 - x)x$ in dollars.

(a) Find the cost function.

Cost $C(x) =$ _____

(b) What kind of function is the revenue function? Circle your answer.

Linear

Quadratic

(c) How many services need to be sold to maximize revenue?

Services sold: _____

(d) Find the profit function.

Profit $P(x) =$ _____

(e) Is it most valuable for a business owner to maximize revenue, or is there something better to maximize (or minimize)? Explain your thinking.

8. 15 points Consider the following functions:

$$f(x) = \frac{5 - 3x}{2}, \quad g(x) = x^3 + 1, \quad h(x) = \sqrt{x - 4}$$

- (a) What is the domain of $h(x)$?

Domain: _____

- (b) Find $h(g(x))$.

$h(g(x)) =$ _____

- (c) Find $(f + h)(5)$.

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

- (d) Find $(gf)(1)$.

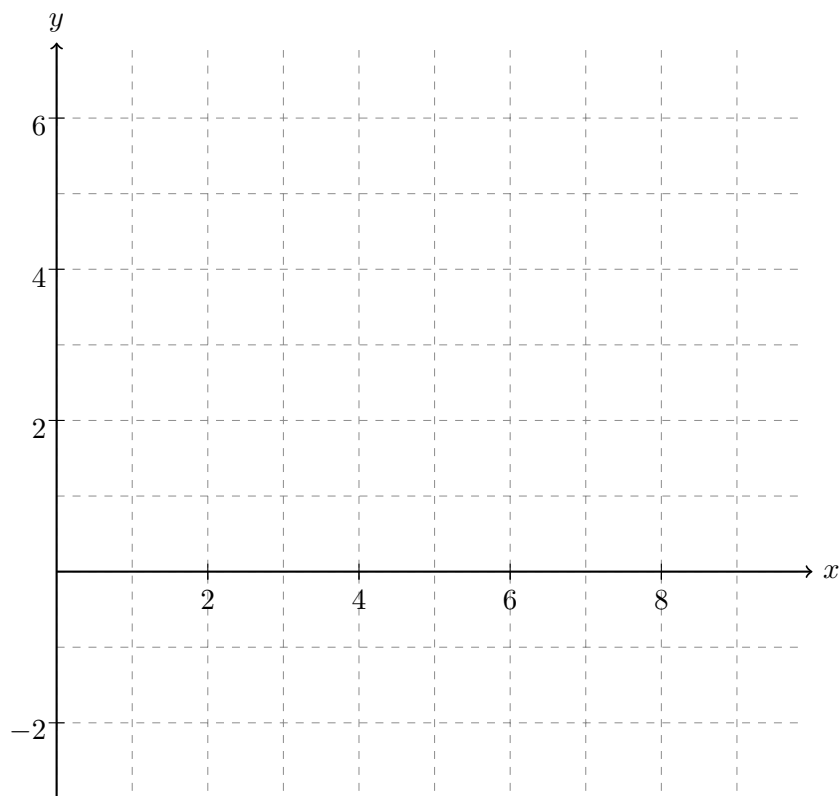
$(gf)(1) =$ _____

- (e) Find $f^{-1}(x)$.

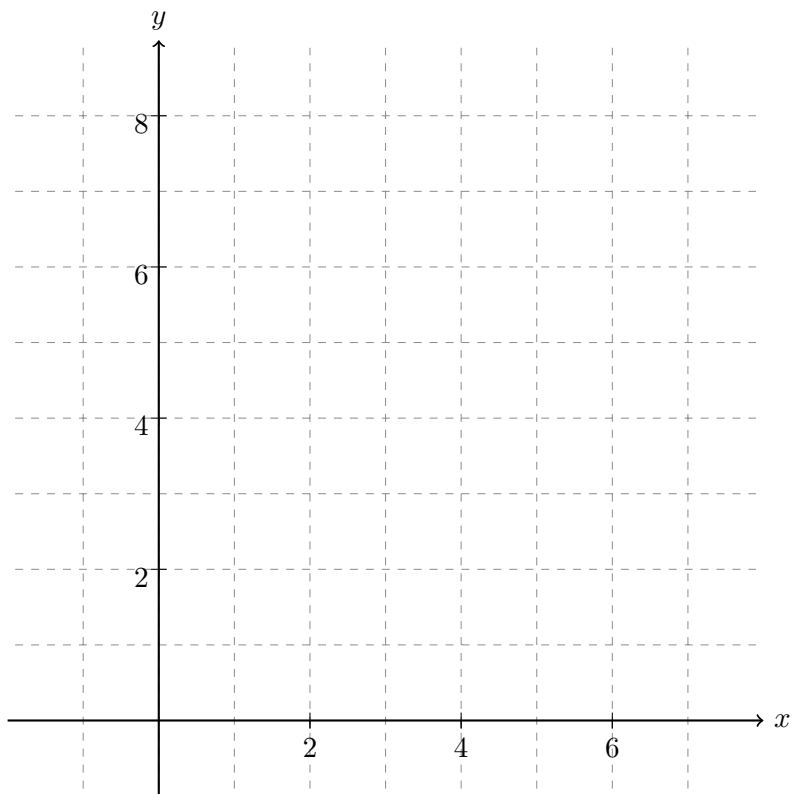
$f^{-1}(x) =$ _____

9. 18 points This question is about the graphs of various functions we studied in class.

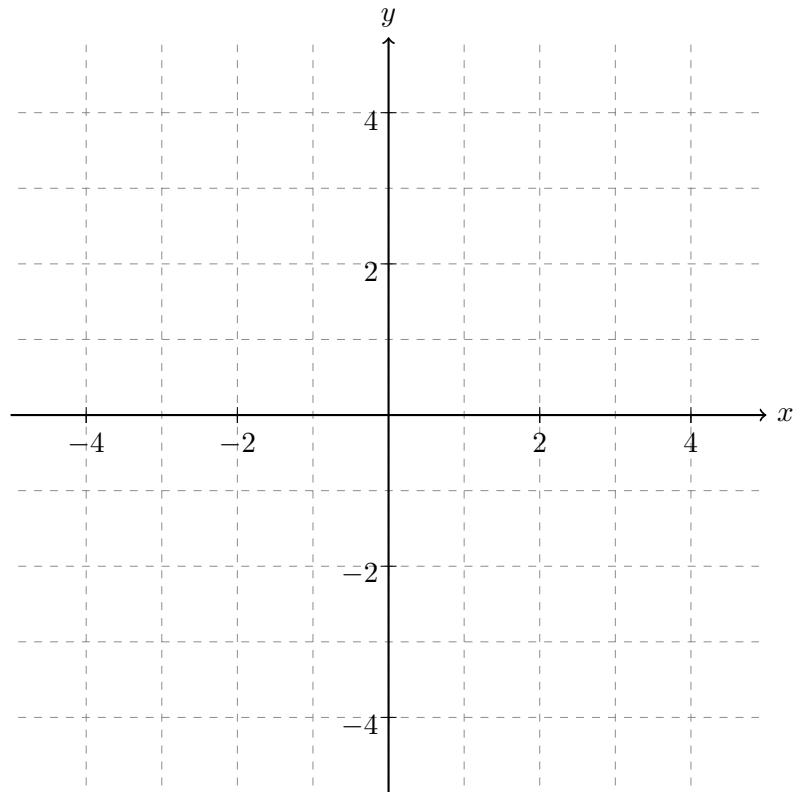
(a) Graph $y = \log_2(x - 4) + 3$. Label at least two points on the graph with coordinates for full credit.



(b) Graph $y = 2^{x-3} + 4$. Label at least two points on the graph with coordinates for full credit.



(c) Graph $y = -x^2 + 1$. Label the vertex and x -intercepts with coordinates for full credit.



Vertex: _____

x -intercepts: _____

10. 15 points Solve the following equations.

(a) $x = \log(100^{1011})$. Your answer should be an integer. **Hint:** A calculator will not help you.

Solution: _____

(b) $2(e^{2x-5}) - 4 = 10$. Give the **exact** answer, with **no calculator** approximation.

Solution: _____

(c) $\log_2(x) + \log_2(x - 1) = 1$. Check the domain for full credit.

Solution: _____

11. 15 points An investor has \$10,000 to invest. Suppose the money is invested at a rate of 7% compounded monthly. How many years will it take the investor to earn \$15,000?

Formula needed: _____

Years: _____

(round your answer to two decimal places)

12. 15 points Magnolia owes \$5,000 in student debt, to be paid off in regular payments over 4 years. If the interest rate is 3%, compounded monthly, what should her monthly payments be?

Formula needed: _____

Monthly payment: _____

(round your answer to two decimal places)

13. 15 points Tony and Maria have a son. They decide to enroll in a savings plan on his second birthday to save for his college education. They want to have \$250,000 saved by the time their son turns 18. Assume their investment earns 6% every year, compounded quarterly, and that they will make deposits at the end of each quarter. How large must their quarterly deposits be to reach their investment goal?

Formula needed: _____

Quarterly deposit: _____

(round your answer to two decimal places)

14. 15 points Imagine Tony and Maria from the previous problem have reached their goal. Their son is starting college and their savings plan contains \$250,000. At the same annual interest rate of 6% compounded quarterly, how much money should their son withdraw from the account at the beginning of each quarter if he plans to spend down the entire account in 4 years?

Formula needed: _____

Withdrawal amount: _____

(round your answer to two decimal places)