Bishop's University

Math 190: Final Exam
Winter 2023

Name: _____

Student #: _____

- This test is 180 minutes in length.

- All answers must be exact (no decimals allowed) unless specifically directed otherwise.

- Prepare neat solutions. Briefly justify your work, that is, *make your reasoning clear.*

- You are permitted to use one (1) **Authorized Memory Book** and a **Casio fx-260 Solar (II) calculator**.

- Do not remove any pages from this test.

- All answers must be written in the space provided.

- The back of each page may be used for scrap paper.

- **Remember that Bishop's University has a ZERO-TOLERANCE POLICY for academic misconduct on final exams.**

Page	Points	Score
2	15	
3	15	
4	15	
5	15	
6	10	
7	10	
8	20	
Total:	100	

1. (5 points) Write 54321_6 in base 10.

2. (5 points) Write 1234 in base 3.

3. (5 points) Multiply 654_8 and 32_8, writing the answer in base 8. You may use the standard algorithms.

4. (5 points) Rationalize the denominator of $\dfrac{6}{4 + \sqrt{13}}$.

5. (5 points) Simplify the following, if possible. Avoid all radicals and negative exponents. All fractions must be in reduced form. Brackets must be removed. Like terms must be combined.

$$\frac{\left((-2x)^3 y^4 z\right)^{-3} \left(x^3 y^2 z^{-2}\right)^2}{(y^3 z^2)^4 (2xy^2 z)^{-7}}$$

6. (5 points) Write as a single fraction and simplify:

$$\frac{1}{x - 3} - \frac{1}{\left(\dfrac{3x}{2} + \dfrac{5}{4}\right)}.$$

7. Expand the following and simplify (remove brackets and combine like terms)
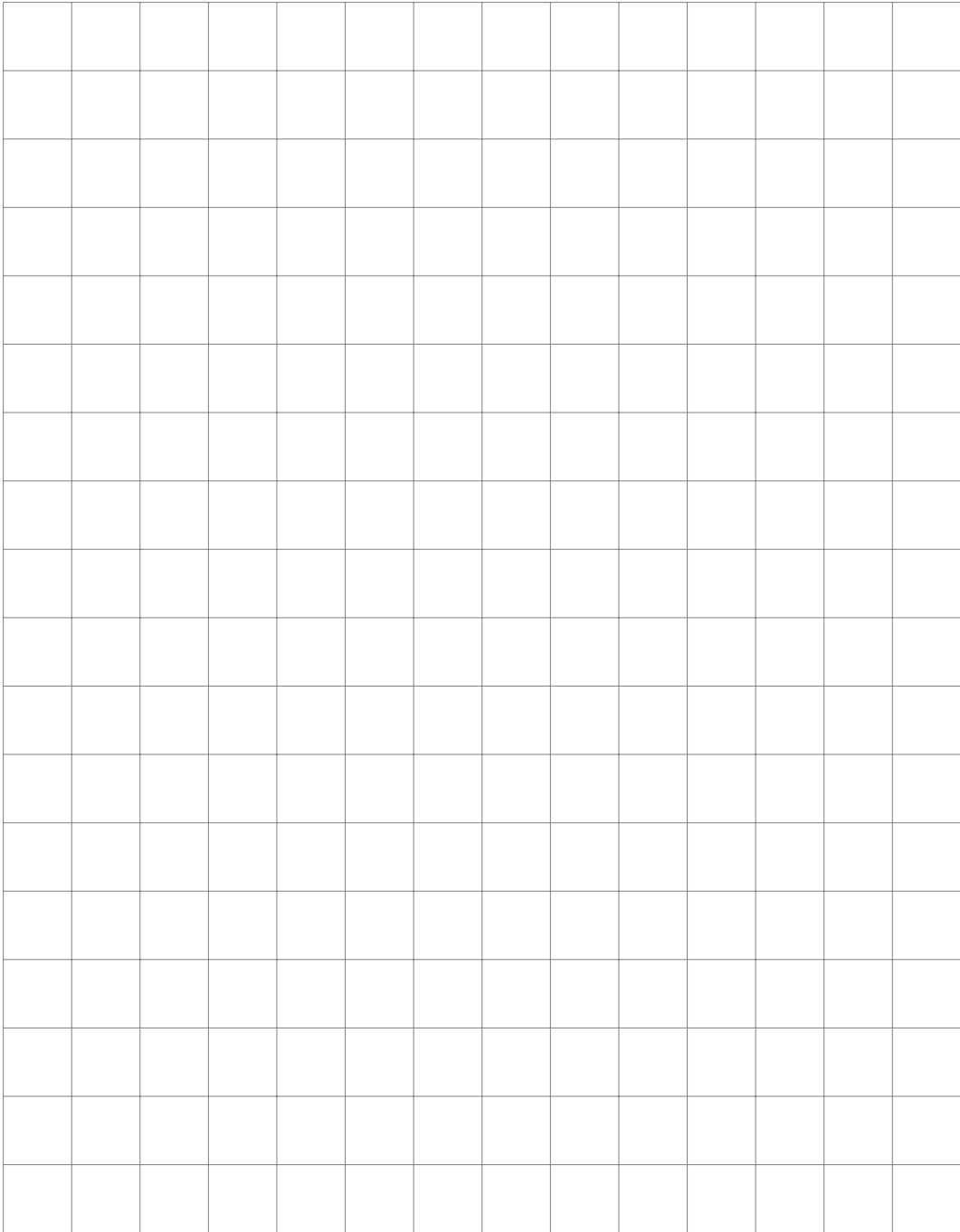
   (a) (5 points) $(2x - 1)^2$

   (b) (5 points) $(x - 1)^3(x + 1)^3$

8. (5 points) Solve $(5x - 2)^2 - 64 = 0$

9. (5 points) Write the domain of $f(x) = \dfrac{\ln(x+8)}{x^2 + 3x - 4}$ using interval notation.

10. (10 points) Fill in the table of values for $f(x) = x^3 - x^2 - 2x + 3$ and plot the graph of f. Remember to properly place and scale the axes.
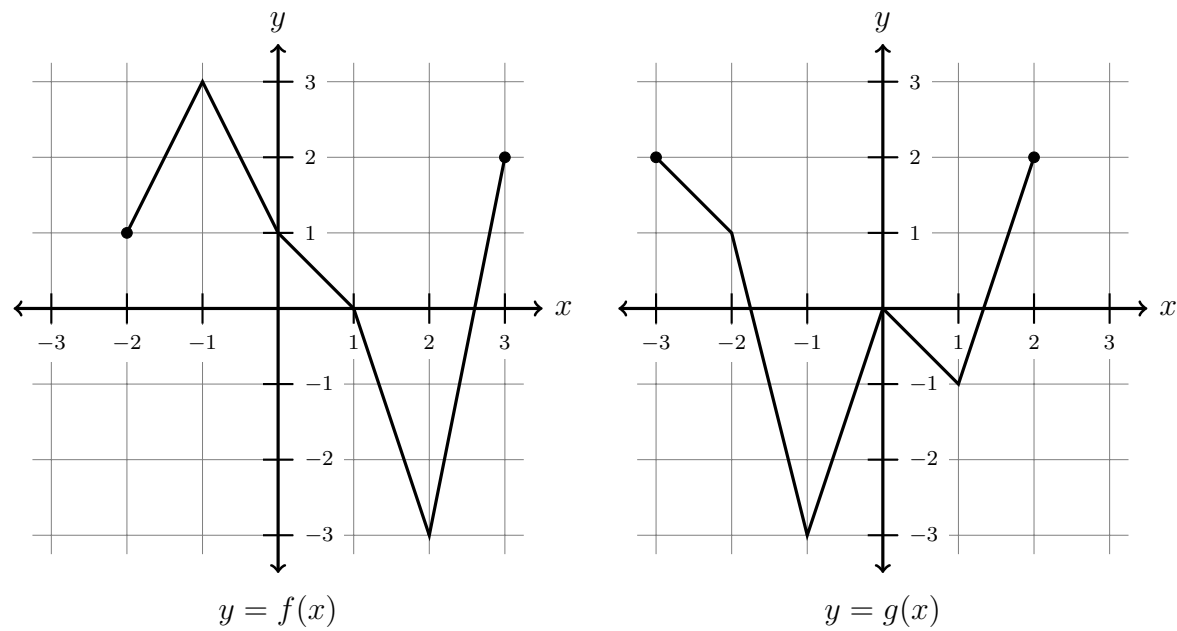
x	-2	-1	0	1	2
$f(x)$					

11. (5 points) The perimeter of a rectangle is 300 feet and the length of the rectangle is 1 foot more than twice the width. Find the area of this rectangle.

12. (5 points) The area of a rectangle is 300 square feet and the length of the rectangle is 1 foot more than twice the width. Find the perimeter of the rectangle.

13. Consider the functions, f and g whose graphs are given below.

$$y = f(x) \qquad\qquad y = g(x)$$

(a) (5 points) Complete the following table of values. If a value is not in the domain, write **DNE**.

x	-3	-2	-1	0	1	2	3
$(f \circ g)(x)$							

(b) (5 points) In reference to the above graphs, evaluate $(f \circ g \circ f \circ g \circ f)(1)$.

14. Assume that $\log_{11} 2 = A$, $\log_{11} 3 = B$, $\log_{11} 5 = C$, and $\log_{11} 7 = D$. Evaluate the following values in terms of $A, B, C,$ and D.

   (a) (5 points) $\log_{11} 12$

   (b) (5 points) $\log_{11} \dfrac{100}{21}$

   (c) (5 points) $\log_9(14 + 63)$

15. (5 points) Solve $4^x - 6 \cdot 2^x + 8 = 0$