Bishop's University

Math 190: Final Exam
Winter 2024

Name: _____

Student #: _____

- This exam is 180 minutes in length.
- All solutions must be written on this exam paper. No extra paper is permitted.
- 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	10	
4	15	
5	15	
6	15	
7	15	
8	15	
Total:	100	

1. (5 points) Write 5615_8 in base 10.

2. (5 points) Write 5615 in base 7.

3. (5 points) Simplify $\sqrt[3]{-826875}$.

4. Perform the following arithmetic in base 12 where the digits are, in order, $0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B$. You may present your reasoning using standard algorithms.

   (a) (5 points) $936A8B_{12} + ABB05_{12}$

   (b) (5 points) $56A17_{12} \times A9_{12}$

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.

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

6. (5 points) Expand $(2x-1)^2(2x+1)^2$.

7. (5 points) Use the fact that one of the factors of $6t^3-29t^2+46t-24$ is $2t-3$ to completely factor $6t^3-29t^2+46t-24$.

8. Write as a single, reduced, fraction. This means no mixed fractions and no fractions within fractions. Remember that the final expressions must either be fully factored or fully expanded. Note any restrictions that are not implicit in the final answer.

   (a) (5 points) $\dfrac{2}{x+1} + \dfrac{x+1}{x+2}$

   (b) (5 points) $\dfrac{\left(\dfrac{2x+3}{x^2+1}\right)}{\left(\dfrac{4x^2+12x+9}{x^4-1}\right)}$

9. (5 points) Rationalize the denominator and simplify the fraction $\dfrac{-4}{3-\sqrt{5}}$

10. (5 points) Solve $\dfrac{18}{2t+1} > 6t$ and sketch the solution.

11. Consider the line, L, given by $5x - 3y = 11$

    (a) (5 points) Find an equation of the line through the point $(2, 4)$ which is perpendicular to L. Write the equation in slope-intercept form.

    (b) (5 points) Find an equation of the line through the point $(2, 4)$ which is parallel to L. Write the equation in point-slope form using the given point.

12. (5 points) Find the domain of $p(q) = \dfrac{1}{\sqrt{2-q-q^2}}$. Write the answer using set-builder notation.

13. (10 points) Consider the function $f(x) = \dfrac{x^2-4}{2x+1}$. Plot the function on the following grid, making sure to use a minimum of 5 points, and indicate important features. Remember to properly place and scale the axes.

14. Let $f(x) = x - \dfrac{2}{x+1}$ and $g(x) = \dfrac{2x-1}{x+4}$.

(a) (5 points) Find the domain of $f \circ g$, and write the answer in interval notation.

(b) (5 points) Solve $g(x) = -2$.

(c) (5 points) Solve $f(x) = 2x$.