Bishop's University

Math 190: Final Exam
Fall 2012

Name: _____

Student #: _____

- This exam is 180 minutes in length.
- Do not remove any pages from this test.
- The back of each page may be used for scrap paper.
- Prepare neat solutions. Briefly justify your work, that is, *make your reasoning clear.*
- All answers must be exact (no decimals allowed) unless specifically directed otherwise.

Page	Points	Score
2	12	
3	18	
4	10	
5	18	
6	14	
7	12	
8	9	
9	7	
Total:	100	

1. Simplify and express all answers in terms of positive exponents. Avoid all radicals in the final form.

   (a) (2 points) $\dfrac{a^2}{b^{-3}}\left(\dfrac{3}{a^3b^2}\right)^2$

   (b) (2 points) $\sqrt[3]{-8x^5}$

2. Solve the equations.

   (a) (2 points) $7x + 2 = 2(x + 6)$

   (b) (2 points) $\dfrac{3}{5 - 2x} = \dfrac{7}{2}$

3. (2 points) Solve the given equation $|5x - 2| = 3$

4. (2 points) Write the equation of a line parallel to $-5x + y - 3 = 0$ which passes through the point $(1, 1)$, in slope-intercept form.

5. Expand and simplify the following:

   (a) (3 points) $(2x-1)(x+4)$.

   (b) (3 points) $(3x-2)^3$.

   (c) (3 points) $(x^2+3x-1)(x+1)(x-1)$.

6. Factor completely the following:

   (a) (3 points) $6x^3y^2 - 2xy^3$.

   (b) (3 points) $x^2+3x-18$.

   (c) (3 points) $a^4 - b^4$.

7. Let $f(x) = x^2 + x$, $g(x) = \dfrac{x}{x^2 - 1}$ and $h(x) = 2 + \sqrt{x - 4}$.

(a) (2 points) Evaluate $(f + h)(5)$.

(b) (2 points) Evaluate and simplify $f(x + 2)$.

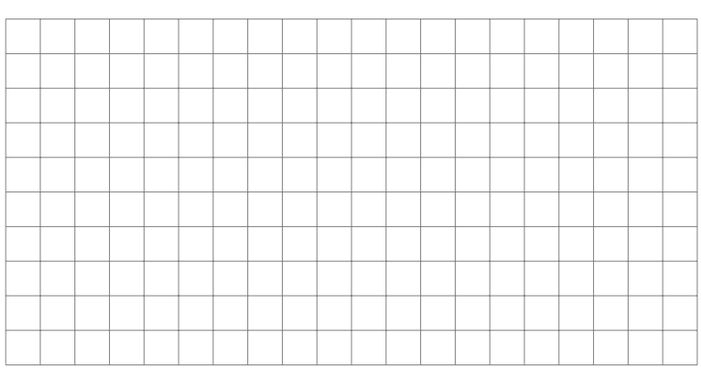
(c) (2 points) Find the domain of g and write in set-builder notation.

(d) (2 points) Find the domain of h and write in interval notation.

(e) (2 points) Find and simplify $(f \circ f)(x)$.

(f) (8 points) Determine if g is symmetric with respect to: (1) the x-axis, (2) the y-axis, (3) the origin, and (4) the line $y = x$.

(g) (4 points) Sketch h on the supplied grid.



8. (6 points) Let $f(x) = \dfrac{x+2}{2x+1}$. Find $f^{-1}(x)$.

9. Express each logarithmic form exponentially and each exponential form logarithmically.

(a) (2 points) $\log_4 256 = 4$.

(b) (2 points) $\log 0.001 = -3$.

(c) (2 points) $5^{-2} = 0.04$.

(d) (2 points) $2^{12} = 4096$.

10. Let $\ln 2 = a$, $\ln 3 = b$, $\ln 5 = c$, and $\ln 7 = d$. Express the indicated logarithm in terms of a, b, c, and d.

(a) (2 points) $\ln 14$

(b) (2 points) $\ln 0.04$

(c) (2 points) $\log_3 21$

11. Solve for x:

(a) (3 points) $\log_4(2x+4) - 3 = \log_4 3$.

(b) (3 points) $\log(x+2)^2 = 2$.

(c) (3 points) $5(3^x - 6) = 15$.

(d) (3 points) $4^x - 6 \cdot 2^x + 8 = 0$.

12. (3 points) In how many ways can three men and two women line up for a group picture?

13. (3 points) In a horse race, a horse is said to *finish in the money* if it finishes in first, second, or thrid place. For an eight-horse race, in how many ways can the horses finish in the money? Assume no ties.

14. (3 points) How many distinguishable arrangements of all the letters in the word LENNOXVILLE are possible?

15. For reasons of comparison, a professor wants to rescale the scores on a set of test papers so that the maximum score is still 100, but the average is 70 instead of 60.

    (a) (3 points) Find a linear function to do this.

    (b) (2 points) If a test scored 76 on the old scale, what is the rescaled grade?

    (c) (2 points) If 61 on the new scale is the passing grade, what was the passing grade on the old scale.