Name:

Recitation Instructor/Time:

Pg 1 36 pts.	Pg 2 33 pts.	Pg 3 33 pts.	Pg 4 36 pts.	Pg 5 36 pts	Pg 6 26 pts	TOTAL 200 pts

COLLEGE ALGEBRA– FINAL EXAM – May 13, 2009

Directions: You will find 20 problems listed below. Please show all your work neatly and box your final answers. No notes or books are allowed. You have two hours to complete this exam.

1. (10 points) Multiply and display your final answer using positive exponents: $\left(\frac{6xy^{-3}}{4x^2y^4}\right)^3$

2. (8 points) Solve $7 + 2(x + 3) = 8 + 4(x + 1)$.

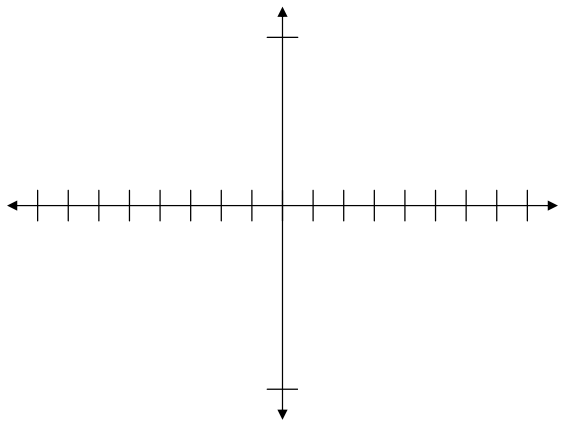
3. (8 points) Solve $4\log(3x) = 8$.

4. (10 points) Combine into a single rational expression, simplifying completely: $\frac{x}{x+1} - \frac{2x}{x+3}$

5. (10 points) Solve and check your answers: $|x-4| = 2x-7$

6. (10 points) Find the dimensions of a rectangular rug whose perimeter is 28 feet and whose area is 48 square feet. **Show all work using algebra and define any variables used.**

7. (a) (7 points) Using your graphing calculator, graph the function $f(x) = -x^3 - 3x^2 + 9x + 13$ over the following intervals: $-8 \leq x \leq 8$ and $-75 \leq y \leq 75$. Find the x-intercepts and relative extrema, and include these points on your graph.



(b) (6 points) On what x-intervals is $f(x)$ decreasing?

8. (15 points) Given the points $(4, 3)$ and $(1, 9)$:

   (a) Find the slope of the line connecting the two points.

   (b) Find the equation of the line connecting the two points. Write answer in slope-intercept form.

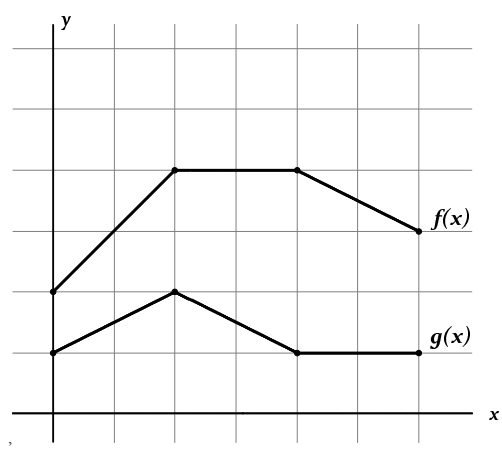
   (c) Find the line passing through the point $(0, 3)$ and parallel to the line found in part (b).

9. (8 points) Solve and check your work: $2x - 5 = \sqrt{4 - x}$.

10. (10 points) Consider the graphs of the functions $f(x)$ and $g(x)$ given below.

    (a) Find $(f + g)(4)$.

    (b) Find $f(g(2))$.



11. Consider the polynomial $f(x) = 2x^3 - 9x^2 + 4x + 15$.

(a) (6 points) List all possible rational zeros of $f(x)$.

(b) (8 points) Confirm that $x = 3$ is a zero of $f(x)$, and use this information to find the other zeros of $f(x)$. You must show your work. Hint: Divide by $x - 3$.

(c) (4 points) Write $f(x)$ as a product of linear factors.

12. (8 points) Find a polynomial with a single zero at $x = 3$, a single zero at $x = -1$, and a single zero at $x = 4$. Multiply your answer out completely.

13. (10 points) Find the matrix product AB of the matrices $A = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 & -4 \\ 1 & -2 & 5 \end{bmatrix}$.

14. (8 points) Find (and explain how you found) the vertical asymptotes of the rational function $r(x) = \dfrac{3x-7}{x^3-8x^2+7x}$.

15. (10 points) A concert hall with a 250 seat capacity consists of two types of seating: \$40 seats and \$60 seats. If a show sells out completely and makes \$12,400 from ticket sales, find the number of each type of seat in the concert hall. **You must define any variables used and show all your work using algebra.**

16. (10 points) Find the inverse of the function $f(x) = x^3 - 8$.

17. (8 points) Write in standard $a + bi$ form the product $(4+6i)(3-2i)$.

18. (8 points) Condense into a single logarithmic expression using properties of logarithms: $5\log(x) + 2\log(y) - \log(\sqrt{z})$. (Here, x,y, and z are all positive.)

19. (10 points) Suppose that in a certain business, there were 30 employees in the year 1920, and 38 employees in the year 1940.

    (a) Assuming an exponential model of growth, $P(t) = P_0 e^{kt}$, what is the exponential growth rate, k? (Here, $t = 0$ corresponds to the year 1920.)

    (b) How many were employed in the year 1947? (Here, $t = 0$ corresponds to the year 1920.)

20. (8 points) Solve: $(x - 4)(x + 5) \geq 0$