Name:
Recitation Instructor:
Recitation Day and Time:

College Algebra – FINAL EXAM – May 14, 2008

Page 1 36 pts	Page 2 38 pts	Page 3 36 pts	Page 4 26 pts	Page 5 34 pts	Page 6 30 pts	TOTAL 200 pts

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.

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

2. (8 points) Solve: $2x^2-4x+4=0$.

3. (10 points) Solve for x and check your work: $\dfrac{1}{x-3}-\dfrac{1}{x+3}=\dfrac{6}{x-3}$.

4. (10 points) Solve and check your answers: $\sqrt{7x-5}=x+1$.

5. (10 points) Solve and check your answers: $|2x - 1| = x + 5$

6. (10 points) Solve $x^3 - 5x^2 \leq 6x$.

7. (8 points) The function $C(t) = \dfrac{.8t + 1200}{4t + 4}$ gives the body concentration, $C(t)$, in parts per million, of a certain dosage of medication t hours after its ingestion. What is the horizontal asymptote of this function, and what is its significance?

8. (10 points) Find a polynomial with a single zero at $x = 1$, a double zero at $x = 0$, and a single zero at $x = 2$. Multiply your answer out completely.

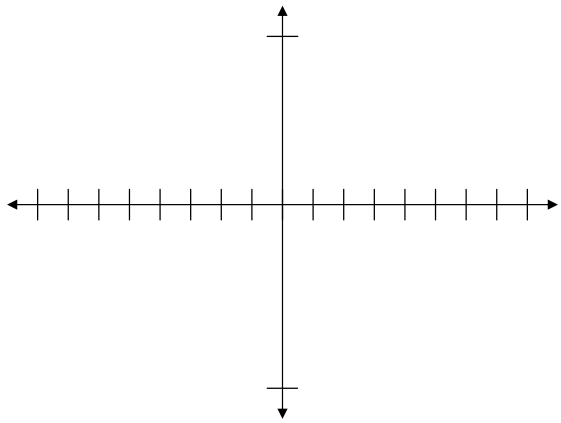
9. (10 points) Find an equation of the parabola with vertex at $(1, 5)$, passing through $(2, 3)$. Write answer in the form $y = ax^2 + bx + c$.

10. (14 points) Consider the polynomial $f(x) = 4x^3 - 16x^2 + 4x - 16$.

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

    (b) Given that $x = 4$ is a zero, find the other zeros of $f(x)$. You must show your work.

11. (a) (7 points) Using your graphing calculator, graph the function $f(x) = x^3 + 4x^2 - 20x - 48$ 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) (5 points) For what x-intervals is $f(x)$ negative? Refer to your graph in your explanation.

12. (10 points) A rectangular garden has a perimeter of 420 feet. The width is three-fourths the length. What are the dimensions of the garden? Please define any variables used and show all your work using algebra.

13. (a) (4 points) Write the augmented matrix determined by the following system:

$$\begin{aligned} x + 3y &= 1 \\ x + y &= 1 \end{aligned}$$

(b) (4 points) Using your calculator, find the inverse of the matrix $A = \begin{bmatrix} 1 & 3 \\ 1 & 1 \end{bmatrix}$.

(c) (4 points) **Without using your calculator**, find the matrix product $A^{-1} \cdot \begin{bmatrix} 1 \\ 1 \end{bmatrix}$.

(d) (4 points) What does your answer in part (c) have to do with solving the system in (a)?

14. (10 points) Coffee brand A costs \$2.50/lb, while brand B costs \$5.50/lb. How much of each brand is required to make a blend of 4 pounds that costs \$4.75/lb? You must define any variables used and show all your work using algebra.

15. (8 points) Given the functions $f(x) = x^2 + 1$ and $g(x) = 2x + 3$:

    (a) Find $(f - g)(x)$ and simplify completely.

    (b) Find $(fg)(x)$ and simplify completely.

16. (8 points) Given the points $(2, 5)$ and $(3, 7)$:

    (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.

17. (8 points) Find the vertical asymptotes of the rational function $r(x) = \dfrac{2x - 1}{x^3 - 4x^2 + 3x}$.

18. (8 points)

(a) Given $f(x) = e^x - 2$, find $f(0)$ and $f(\ln 2)$.

(b) Does the graph of $f(x)$ have a horizontal asymptote? If so, what is it?

19. (8 points) Expand using properties of logarithms: $\log\left(\frac{\sqrt{xy}}{z^3}\right)$. (Here, x,y, and z are all positive.)

20. (14 points) An ancient artifact is found to have 25% of the Carbon-14 present in living matter. Given that the half-life of Carbon-14 is 5,750 years, answer the following questions.

(a) Assuming an exponential decay model, $P(t) = P_0 e^{kt}$, what is the value of k for this situation?

(b) Using your answer in part (a), find the age of the artifact.

Pledge: On my honor, as a student, I have neither given nor received unauthorized aid on this examination.

Signature:_____ Date:_____