NAME _____ Rec. Instr. _____

Signature _____ Rec. Day/Time _____

College Algebra – Final Exam
May 11, 2005

<u>Show all work</u> for full credit. You may use a calculator, but show algebraic computations whenever possible. No notes or books are allowed.

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Points											

(7 pts) 1. Solve the equation $(2x-1)(3x+1) = (x-1)(6x+7)$.

2. Simplify the following. (An exact answer, no decimal approximation, is wanted in (a)).

(6 pts) (a) $\log_3(81)$

(6 pts) (b) $\sqrt{18x^2y^4}$

(9 pts) (c) $\dfrac{\dfrac{3x+12}{2x-8}}{\dfrac{(x+4)^2}{(x-4)^2}}$

(6 pts) 3. Write as a single logarithm, simplifying where possible.

$$\ln(x^3) - 4\ln(\sqrt{x}) + \frac{1}{2}\ln(x)$$

(8 pts) 4. Solve the inequality $|2x - 5| > 15$.

(8 pts) 5. Find all vertical and horizontal asymptotes of $y = \dfrac{x^2 + 3x + 5}{x^2 - 5x + 6}$ and explain what you did to find them.

(6 pts) 6. Complete the square to find the x- and y-coordinates of the vertex of the parabola
$y = x^2 + 10x + 23$.

(8 pts) 7. Solve the equation $\log_2(x+1) + \log_2(x-1) = 3$.

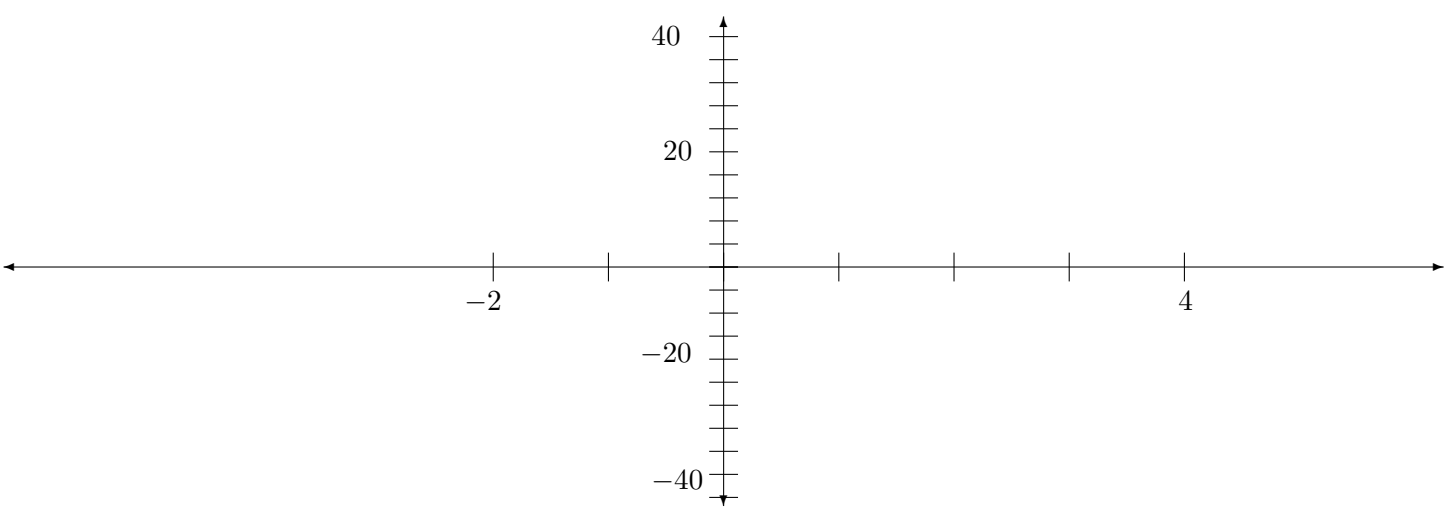
(8 pts) 8. Solve the inequality $\dfrac{x+1}{x-2} \geq 3$.

(12 pts) 9. Solve the system of equations $\{x - 3y = 2, 6x + 5y = -34\}$ using the following two methods.

(a) Back-substitution.

(b) Give the augmented matrix, and find its reduced row-echelon form. (Show all work, giving each step of the row reduction.)

(8 pts) 10. Use your graphing calculator to graph the function $y = f(x) = 3x^4 - 11x^3 + 10x - 4$ using the window $-2 \leq x \leq 4$ and $-40 \leq y \leq 40$. Give the intervals where the function is decreasing.



(15 pts) 11. Solve the equation $x^2 - 3x = -2$ by each of the following three methods.

(a) Completion of the square.

(b) Use of the quadratic formula.

(c) Factoring.

(8 pts) 12. Use the compound interest formula $A(t) = P\left(1 + \frac{i}{n}\right)^{nt}$ to determine the time it takes an investment to double if the interest is 12 percent per year but it is compounded 6 times per year.

(7 pts) 13. Divide the complex numbers, writing your answer in the standard form $a + bi$.

$$\frac{5+2i}{3-4i}$$

(14 pts) 14. Use your calculator to solve the system of equations via each of the following two methods.

$$\left\{\begin{array}{ll} x+2y+3z & =-1 \\ 2x-3y+4z & =2 \\ -3x+5y-6z & =4 \end{array}\right\}$$

(a) Give the augmented matrix, use your calculator to find the reduced row echelon form, and from it infer the solution to the equations.

(b) Give the coefficient matrix, use your calculator to find the inverse matrix, and multiply this inverse matrix by the appropriate column matrix, to produce a column matrix that expresses the solution.

(8 pts) 15. Find the inverse function of the function $f(x) = \dfrac{5x-3}{2x+1}$.

(13 pts) 16. A rancher needs to enclose two adjacent rectangular corrals, one for sheep and one for cattle. A river forms one side of the corrals and 240 yd of fencing is available.

(a) Find an equation for the total area as a function of one variable.

(b) What is the largest total area that can be enclosed?

(5 pts) 17. Use the Rational Zero Theorem to <u>list all possible</u> rational zeros of $y = 3x^4 + x^3 - 4x^2 + x - 8$.

(8 pts) 18. A population of bacteria doubles every 4 hours. Find the initial number of bacteria if there are 400 bacteria after 8 hours.

(8 pts) 19. Solve the equation $\dfrac{5x}{x-4} + \dfrac{20}{x} = \dfrac{80}{x^2 - 4x}$.

(6 pts) 20. Multiply the matrices $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \cdot \begin{pmatrix} -1 & 0 \\ 5 & 0 \end{pmatrix}$.

(8 pts) 21. Solve the equation $\sqrt{x+4} - 2 = 1$.

(8 pts) 22. Find an equation for the circle having points $(7, 13)$ and $(-3, -11)$ at either end of one of its diameters.