Name:

Recitation Instructor:

Recitation Day & Time:

Total/200	Grade

MATH 100 College Algebra – Final Exam

7:00–8:50pm, Wednesday December 14, 2005

Check that you have all five pages. SHOW ALL YOUR WORK. Write complex answers in $a + bi$ form.

1. (6 points) Perform the division: $(3x^3 - 8x^2 - 7) \div (x - 3)$:

Quotient=_____, Remainder=_____.

2. (12 points) $f(x) = x^3 + 2x^2 - 12x - 16$.

(a) Use the rational-zeros test to find a rational zero of f. List all the *possible* rational zeros given by the test, as well as the actual zeros.

(b) Find the remaining zeros of f (including complex zeros).

3. (10 points) Factor into linear factors (using complex numbers where necessary):

(a) $5x^2 + 7x - 6 =$

(b) $x^4 - x^2 - 2 =$

4. (10 points) (a) Find the slope of the line passing through $(3, -1)$ and $(-1, 7)$.

(b) An equation for the line in (a) is $y =$ _____.

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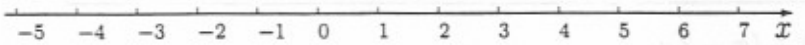
5. (8 points) (a) Find the critical values for the inequality $x^3 \leq 4x$.

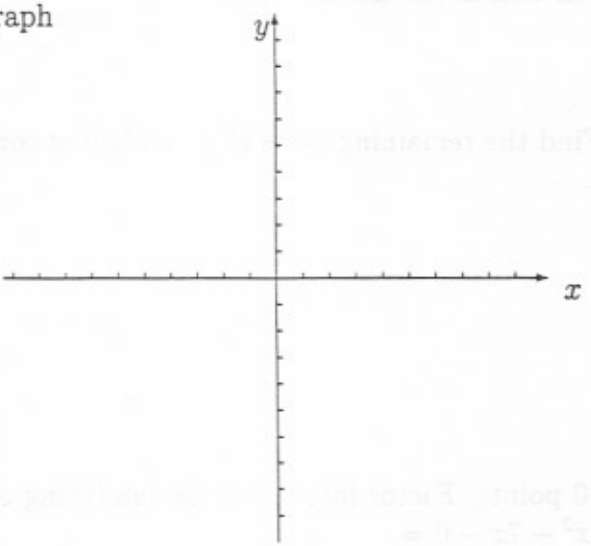
(b) Solve the inequality in (a). Sketch the solution below (remember to indicate the status of endpoints).



6. (10 points) Find all x satisfying the equation: $\dfrac{2x}{x-3} - \dfrac{18}{x^2-3x} = \dfrac{5}{x}$.

7. (12 points) Provide the following information and use it to graph

$$g(x) = \frac{3x^2}{x^2-16}.$$



(a) The x-intercept(s) and y-intercept(s):

(b) Equations for all the vertical asymptotes:

(c) Equation of the horizontal asymptote:

(d) Symmetry: Is $g(x)$ even, odd or neither?

8. (12 points) For the following functions find the vertical, horizontal and oblique asymptotes (write an equation for the asymptote in the space provided or N/A if there is not an asymptote of that type):

	vertical	horizontal	oblique
$f(x) = \dfrac{2x^2+3x}{x-3}$			
$f(x) = \dfrac{5x-10}{x^2-5x}$			

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9. (9 points) Solve the inequality $|2x - 7| \leq 5$. Give your answer in interval notation.

10. (10 points) Find all the real numbers x which satisfy the equation $\sqrt{x+2} + 4 = x$.

11. (12 points) (a) Simplify: $\dfrac{\dfrac{2}{x+1} - \dfrac{1}{x-1}}{\dfrac{4}{x+1} - \dfrac{3}{x}}$.

(b) Perform the subtraction and simplify: $\dfrac{4}{y^2 - 4} - \dfrac{5}{y^2 + y - 6}$.

12. (10 points) Simplify so that only positive rational exponents occur (assume that x and y are positive):

(a) $\dfrac{(x^3y^2)^2}{x^2y^3}$

(b) $\sqrt[5]{y\sqrt{y^3}}$

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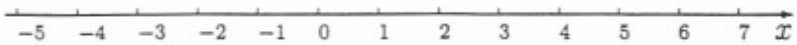
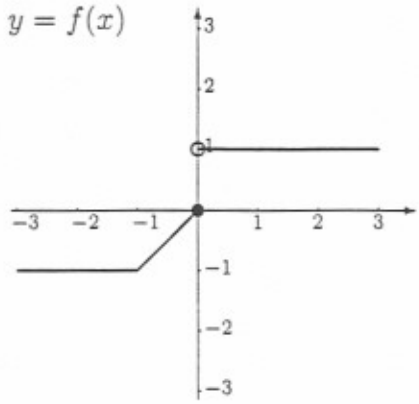
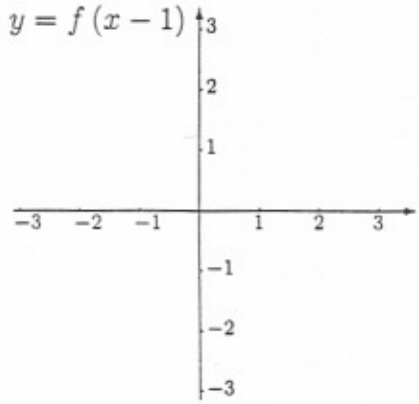
13. (8 points) (a) Find the critical values for the inequality $1 \leq \dfrac{3}{x+1}$.

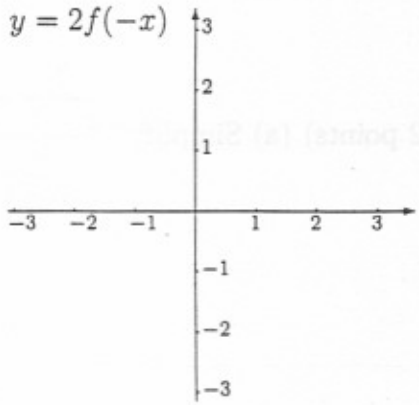
(b) Solve the inequality in (a). Sketch the solution below (remember to indicate the status of endpoints).



14. (9 points) The graph of $y = f(x)$ is shown in the first picture. Sketch the graphs requested on the other two. Underneath describe the transformations in words.







15. (16 points) (a) Write as a single logarithm: $\dfrac{1}{3}\ln x - 3\ln y + 2\ln z =$

(b) Express in terms of natural logarithms: $\log_5 19 =$

(c) Solve the logarithmic equation $\log_2(x+5) - \log_2(x) = 3$.

16. (8 points) Use the method of elimination or substitution to solve the system of equations

$$7x + 5y = 4$$
$$3x + 2y = 1.$$

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17. (12 points) (a) If $f(x) = x^2 + x + 3$ and $g(x) = x - 1$, then the composition $(f \circ g)(x) =$

(b) If $h(x) = \sqrt[3]{3x - 2}$, then the inverse function $h^{-1}(x) =$

18. (10 points) A savings account offers an annual rate of 3.25% compounded continuously.

(a) If \$10,000 is deposited in the account what will be the balance after 5 years?

(b) What is the tripling time (i.e., the time for the amount in the account to triple)?

19. (8 points) (a) Give the augmented matrix for the system of equations:

$$\begin{aligned} 3x - 2y + 5z &= 8 \\ 2x + y - 3z &= 1 \\ x - 3y - 2z &= 2. \end{aligned}$$

(b) Use your calculator to find the reduced row-echelon form of the matrix in (a).

(c) Use (b) to solve the system of equations in (a): $x =$ ____, $y =$ ____, $z =$ ____.

20. (8 points) (a) Write the system as a matrix equation $AX = B$

$$\begin{aligned} 2x + y - 3z &= 2 \\ x - y + z &= 5 \\ x - z &= 1. \end{aligned}$$

(b) Use your calculator to find A^{-1}, the inverse of the coefficient matrix A, then $A^{-1}B$.

$A^{-1} =$ $\qquad\qquad$ $A^{-1}B =$

(c) Use (b) to solve the system of equations in (a): $x =$ ____, $y =$ ____, $z =$ ____.

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