Name:

Recitation Instructor:

Recitation Day & Time:

Total/200	Grade

MATH 100 College Algebra – Final Exam

7:00–8:50pm, Wednesday May 10, 2006

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

1. (6 points) Perform the division: $(3x^3 + 5x^2 - 7) \div (x - 2)$:

Quotient=_____, Remainder=_____.

2. (12 points) $f(x) = 2x^3 - x^2 + 18x - 9$.

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

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

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

(a) $4x^2 + 10x - 6 =$

(b) $x^4 + x^2 - 12 =$

4. (10 points) (a) Find the slope of the line passing through $(2, 3)$ and $(-1, 6)$.

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

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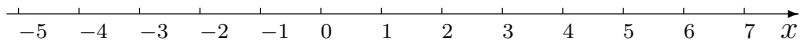
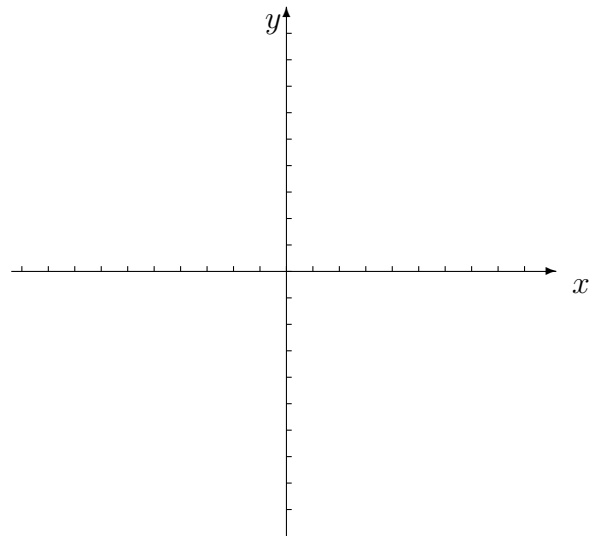
5. (8 points) Solve the polynomial inequality $3x^2 \leq 2x^3$. Sketch the solution below (remember to indicate the status of endpoints).



6. (10 points) Find all x satisfying the equation: $\dfrac{4}{x^2-3x} - \dfrac{4}{x} = \dfrac{2x}{x-3}$.

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

$$g(x) = \frac{3x}{x^2-9}.$$



(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
$f(x) = \dfrac{x^2}{x-8}$			
$g(x) = \dfrac{3x+2}{2x+4}$			

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9. (9 points) Solve the inequality $|2x - 1| \geq 1$. Give your answer in interval notation.

10. (10 points) Find all the real numbers x which satisfy the equation $\sqrt{x+6} + x = 0$.

11. (12 points) (a) Simplify: $\dfrac{\dfrac{5}{x+2} + \dfrac{3}{x}}{\dfrac{4x+3}{x+2}}$.

(b) Perform the subtraction and simplify: $\dfrac{y}{y^2 - y - 20} - \dfrac{2}{y+4}$.

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

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

(b) $\dfrac{\sqrt[3]{y^4}}{\sqrt{y}}$

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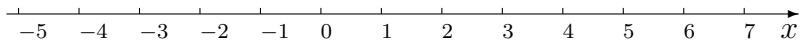
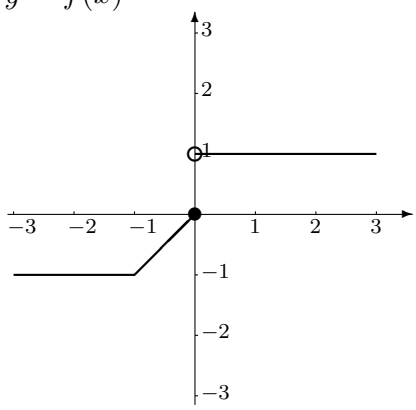
13. (8 points) (a) Find the critical values for the inequality $2 \leq \dfrac{5}{x-1}$.

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

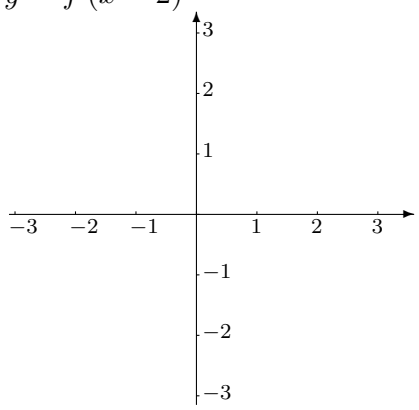


14. (9 points) The graph of $y = f(x)$ is shown in the first picture. Sketch the graphs requested on the other two. Underneath describe in words the transformations of the graph of $y = f(x)$.

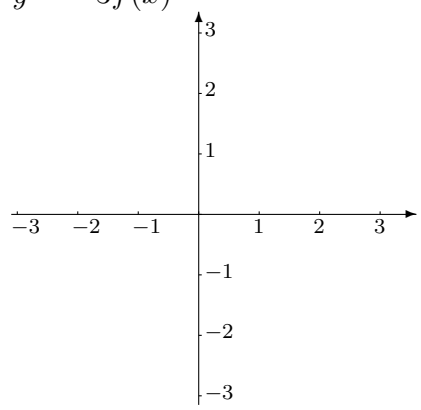
$y = f(x)$



$y = f(x-2)$



$y = -3f(x)$



15. (16 points) (a) Write as a single logarithm: $\dfrac{1}{4}\ln x + \ln y - 5\ln z =$

(b) Express $\log_2 18$ in terms of natural logarithms. Use the calculator to evaluate it to 3 decimal places.

(c) Solve the logarithmic equation $\log_4(x-3) - \log_4(x) = 1$.

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

$$\begin{aligned} 3x + 4y &= 10 \\ x - y &= 1. \end{aligned}$$

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17. (12 points) (a) If $f(x) = x^2 + 5$ and $g(x) = x - 2$, then the composition $(f \circ g)(x) =$

(b) If $h(x) = 2x^3 + 6$, then the inverse function $h^{-1}(x) =$

18. (10 points) A savings account offers an annual rate of 5% compounded continuously.

(a) If $\$8,000$ 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:

$$\begin{aligned} 3x - 2y + 4z &= 15 \\ 2x + 2y + z &= 30 \\ x - 3y + z &= 3. \end{aligned}$$

(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 below as a matrix equation $AX = B$

$$\begin{aligned} 2x + 3y + 2z &= -2 \\ 3x + 3y + 4z &= 1 \\ -x - y - z &= 2. \end{aligned}$$

(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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