Math 1050
Departmental Final Exam
Spring 2007

Section: 2

Name: ____________________ Student ID# ____________________

Instructions:

1. This exam is closed books and notes.
2. You may **not** use a calculator or any other electronic device.
3. Simplify any algebraic expressions, unless otherwise instructed, and reduce any fractions.
4. All questions have equal weight.
5. If you are done before the allotted time is up, we recommend strongly that you stay and use the remaining time to check your answers.

Problem	Score
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TOTAL	

1. **(Equation of a line.)** Find an equation of the line passing through (2,3) and (5,1).

2. **(A quadratic equation.)** Solve $\sqrt{3x-5} = x - 1$.

3. **(A function.)** Let $f(x) = \dfrac{3x-4}{2x+1}$.

(a) What is the domain of f?

(b) Find $f(2)$.

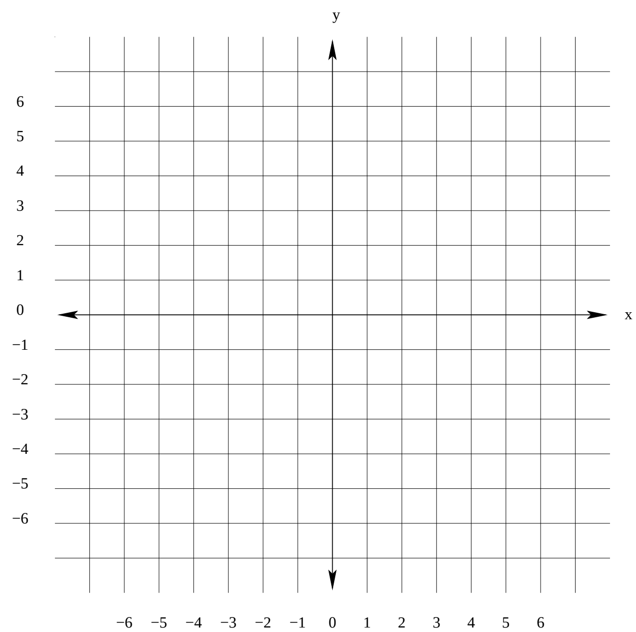
(c) If $g(x) = 3x^2 + 1$, what is $f \circ g(x)$? Do not simplify.

(d) Find $f^{-1}(x)$, the inverse function of f.

4. **(A linear system.)** Solve the following system of equations:

$$\begin{aligned} x + y + 2z &= -1 \\ x - 2y - z &= 2 \\ x - y + z &= 0 \end{aligned}$$

5. **(Graphing.)** Describe how to obtain the graph of $f(x) = (x-1)^2 + 2$ from the graph of $f(x) = x^2$ by suitable shifts. In the coordinate system below, draw and clearly label the graphs of f and g.



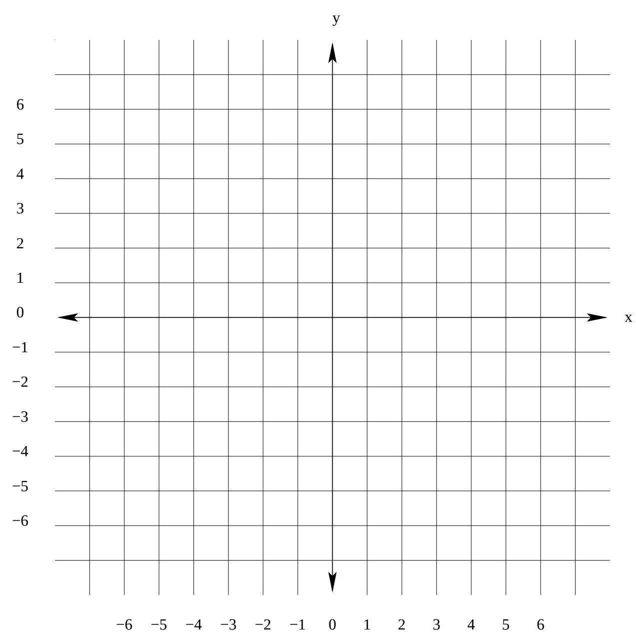
6. **(Graphing.)** Let

$$f(x)\ \frac{x-1}{x^2-3x}.$$

(a) What is the x-intercept?

(b) What are the asymptotes (vertical, horizontal or oblique)?

(c) Sketch the graph of f.



7. **(Simplifying Algebraic Expressions.)** Simplify $3x^{-2}(2x^4)^2$.

8. **(Logarithm rules.)** Use the properties of logarithms to write as a sum, difference, and/or multiple of logarithms:

$$\log\left(\frac{14x^3}{x-5}\right)$$

9. **(Logarithms.)** Solve

$$\ln x - \ln(x-4) - \ln(x-3) = 0.$$

10. **(Exponentials.)** Solve

$$2^{x^2-5x-1} = 16.$$

11. **(Matrices.)** Given that $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, and $B = \begin{bmatrix} 1 & 2 \\ 1 & -1 \end{bmatrix}$, compute AB.

12. **(More on matrices.)** Let $A = \begin{bmatrix} 1 & 2 \\ -1 & 2 \end{bmatrix}$. Compute the inverse of A and use it to solve the linear system

$$\begin{aligned} x + 2y &= 0 \\ -x + 2y &= 1 \end{aligned}$$

13. **(Summer fun.)** You are running a summer camp with 20 kids. One day you want to send a group of three to go fishing. How many different groups of three are possible?

14. **(Geometric Series.)** For this problem, you may leave your answer in the form of an expression involving numbers. You deposit \$100 into a savings account at the beginning of each month. The account pays 1% interest per month. How much money is in your account after 10 years?

15. **(The Binomial Theorem.)** Use the Binomial Theorem to expand and simplify

$$(a - 2b)^5.$$

16. **(Mathematical Induction.)** Use Mathematical Induction to show that the sum of the first n odd numbers equals n^2, i.e.,

$$\sum_{i=1}^{n}(2i-1) = n^2.$$