Name:

Winter 2009, Math 103, Final Exam, Form 1,(200 points)

Part I: <u>Do any 4 of the following 5 problems</u>. Do not do more than 4 problems. ***(8 points each)***

1. Factor the polynomial completely. $x^3+3x^2-9x-27$

2. Use the properties of logarithms to condense the expression. $3\ln x-\ln y+2\ln z$

3. Multiply and simplify. $(5\sqrt{2}-2\sqrt{5})^2$

4. Simplify. Write your answer without negative exponents. $\dfrac{5x^2y^{-3}z^0}{10x^{-2}y^{10}}$

5. Simplify. $\sqrt[3]{16x^3y^{10}}$

Part II: <u>Do any 4 of the following 5 problems</u>. Do not do more than 4 problems.
For all equations, be sure to simplify your solutions, give exact solutions *(i.e. don't use your calculator to give decimal approximations.)*, and write any non-real solutions in the standard form for complex numbers. *(Recall standard form is $a+bi$.)*
(9 points each)

1. Solve the equation. $|3-4x|=10$

2. Solve the equation. $5x^2-20x+25=0$

3. Solve the equation. $\dfrac{9}{x^2+9x+14}+\dfrac{x}{x+2}=1$

4. Solve the equation. $\sqrt{11-x}=x+1$

5. Solve the equation. $\log_5(2x+3)+1=2$

Part III: <u>Do any 3 of the following 4 problems</u>. Do not do more than 3 problems
(9 points each)

1. Solve. Graph the solution on the real number line. $-3(x+4) > x+5$

2. Solve. Graph the solution on the real number line. $|6-5x| \leq 6$

3. Solve. Graph the solution on the real number line. $x^2+5x-66<0$

4. Solve the system of equations. $\begin{cases} 5x+3y=8 \\ 2x-y=12 \end{cases}$

Part IV: <u>Do any 4 of the following 5 problems</u>. Do not do more than 4 problems.
(9 points each)

1. Write the equation of the parabola in standard form. (Standard form is $y = a(x-h)^2 + k$.)

$y = 5x^2 + 30x + 30$

2. Find the equation of the line which is parallel to the line $2x+3y=6$ and which passes through the point (4,-1). Write your answer in slope-intercept form.

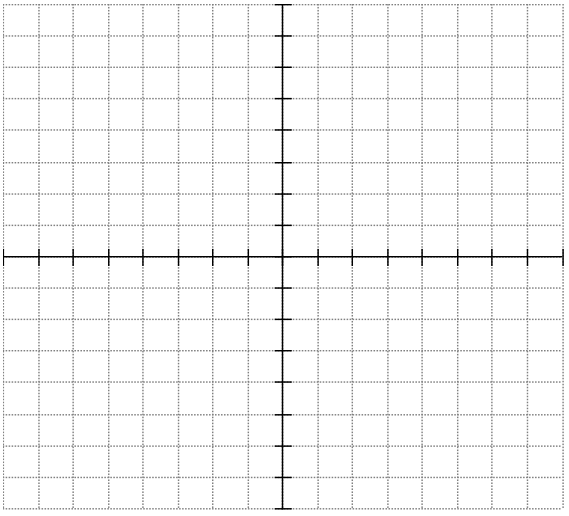
3. Given $f(x) = 2x - 3$ and $g(x) = x^2 + 3$, find and simplify $(f \circ g)(x)$.

4. Find the inverse function of $f(x) = \frac{1}{3}x + 5$.

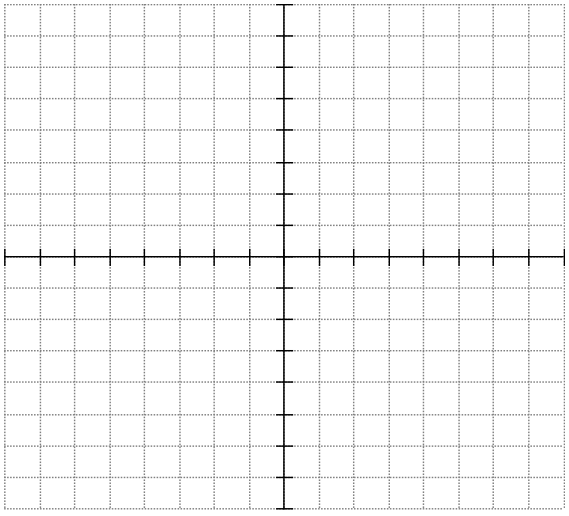
5. Determine whether the relation {(0,1),(1,1),(2,1),(3,1)} is a function or not. Explain your answer.

Part V: <u>Do any 3 of the following 4 problems</u>. Do not do more than 3 problems.
(8 points each)

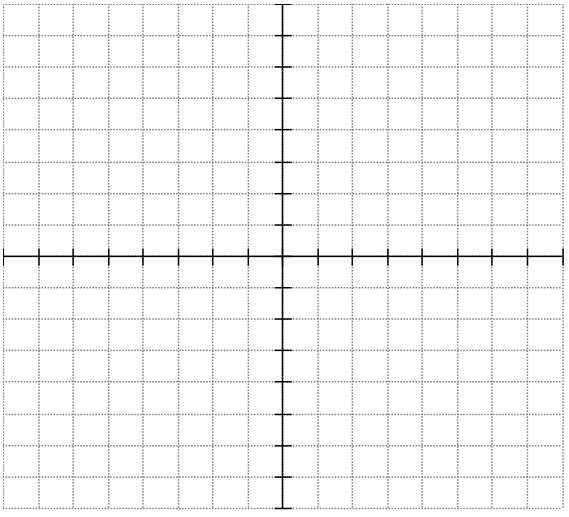
1. Sketch the graph of $f(x) = 2^x + 1$.
(Be sure to graph the asymptote.)



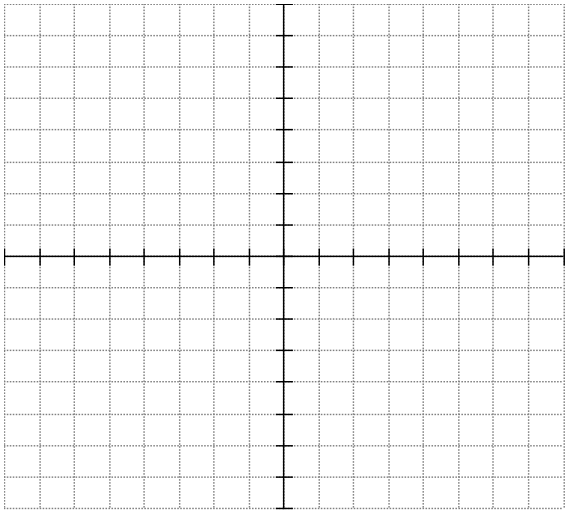
2. Sketch the graph of $f(x) = \log_6 x$.
(Be sure to graph the asymptote.)



3. Sketch the graph of $f(x) = |x - 3|$.



4. Sketch the graph of the solution to
$x - 3y > 6$



Part VI: <u>Do any 2 of the following 3 problems</u>. Do not do more than 2 problems
(9 points each)

1. Divide and simplify. $\dfrac{x^2+4x}{x^2-16} \div \dfrac{x+1}{x^2-3x-4}$

2. Subtract and simplify. $\dfrac{3}{2x^2-5x-3} - \dfrac{3}{2x-6}$

3. Simplify the complex fraction. $\dfrac{\dfrac{7}{x}+\dfrac{2}{x+3}}{\dfrac{3}{x+3}-\dfrac{1}{x}}$

Part VII: <u>Do any 2 of the following 3 problems</u>. Do not do more than 2 problems
(9 points each)

1. You can mow a lawn in 2 hours and your friend can mow it in 3 hours. How long will it take both of you to mow the lawn working together? **For full credit, set up and solve an equation(s).**

2. The length of a rectangle is 3 inches longer than twice its width. The area of the rectangle is 20 square inches. Find the length and the width of the rectangle. **For full credit, set up and solve an equation(s).**

3. Lance bicycles 100 miles at the rate of r mph. The same trip would have taken 1 hour longer if he had decreased his speed by 5 mph. Find r. **For full credit, set up and solve an equation(s).**

Part VIII: You have no options in this part. <u>You must do the following problem</u> ***(9 points)***

A deposit of $150 is placed in a savings account for 4 years. The interest on the account is compounded continuously. At the end of 4 years, the balance of the account is $165.78. What is the annual interest rate for this account?

The formula for continuous compounding is $A = Pe^{rt}$.

<u>The remaining problems are extra credit</u>.

1. ***(5 points)*** Factor the polynomial completely.

$$9r^2 - 12rs + 4s^2 - 9t^2$$

2. ***(5 points)*** Rationalize the denominator and simplify.

$$\frac{6x}{\sqrt[5]{9x}}$$

Answers for Math 103 Final Exam Practice (W 2009, Form 1)

Part I

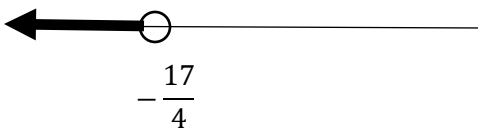
1. $(x+3)^2(x-3)$
2. $\ln\left(\frac{x^3z^2}{y}\right)$
3. $70-20\sqrt{10}$
4. $\frac{x^4}{2y^{13}}$
5. $2xy^3\sqrt[3]{2y}$

Part II

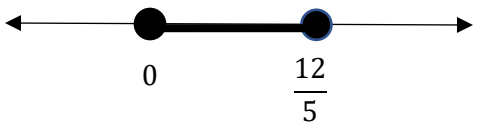
1. $x=-\frac{7}{4}\ and\ \frac{13}{4}$
2. $x=2\pm i$
3. $x=-\frac{5}{2}$
4. $x=2$
5. $x=1$

Part III

1. $\left(-\infty,-\frac{17}{4}\right)$



2. $\left[0,\frac{12}{5}\right]$



3. $(-11,6)$

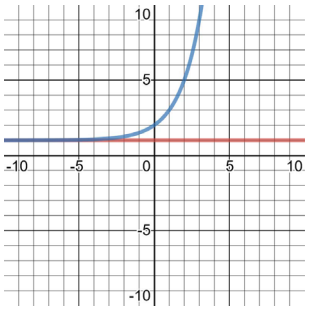
4. $(4,-4)$

Part IV

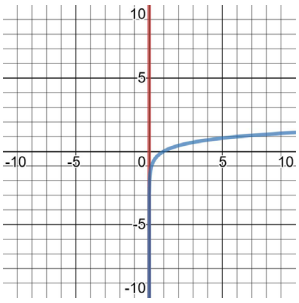
1. $y=5(x+3)^2-15$
2. $y=-\frac{2}{3}x+\frac{5}{3}$
3. $2x^2+3$
4. $f^{-1}(x)=3x-15$
5. A function, each input has only one output

Part V

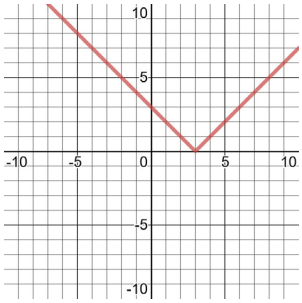
1.



2.



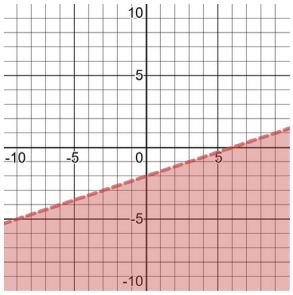
3.



Answers for Math 103 Final Exam Practice (W09, F1) continued

Part V continued

4.



Part VI

1. x
2. $-\frac{3(2x-1)}{2(x-3)(2x+1)}$
3. $\frac{3(3x+7)}{2x-3}$

Part VII

1. $\frac{6}{5}\ hours\ or\ 1.2\ hours$
2. $w = \frac{5}{2}\ inches; l = 8\ inches$
3. $25\ mph$

Part VIII

1. 2.5%

Extra Credit

1. $(3r - 2s - 3t)(3r - 2s + 3t)$
2. $2\sqrt[5]{27x^4}$