

Name:
Class time:

M305G - Practice Exam II - October 2008

Carefully read each question, and be sure to show your work.

1. (15 points) Let $f(x) = \frac{3x}{x+2}$. Note: this is a one-to-one function.

(a) (5 points) What is $f^{-1}(x)$?

(b) (5 points) Verify your answer for part (a) by computing $f(f^{-1}(x))$ and $f^{-1}(f(x))$.

(c) (5 points) What is the range of f ?

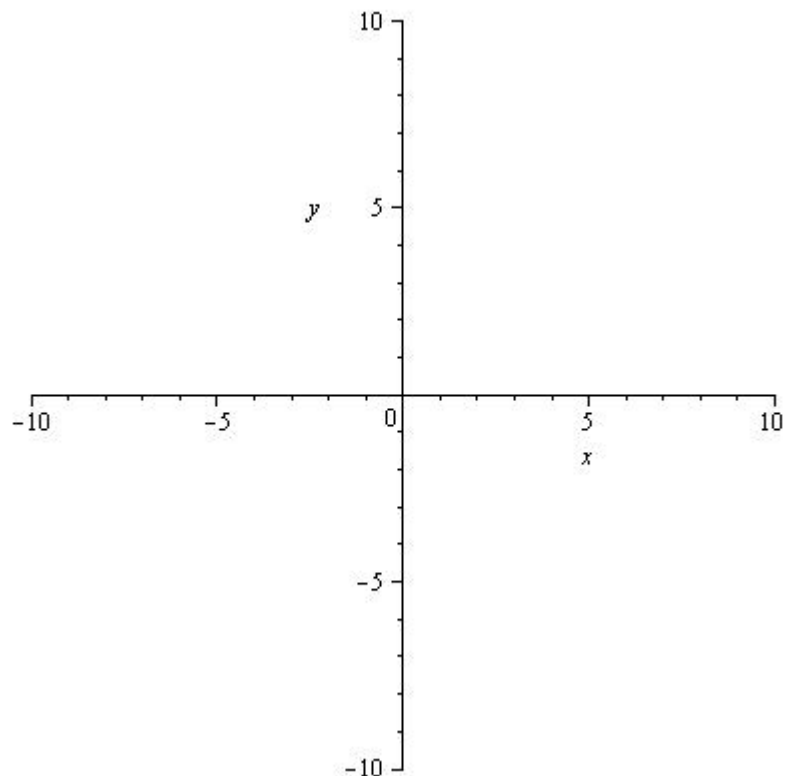
2. (20 points) Let $p(x) = 2x^2 + 6x - 20$ and $q(x) = x^2 - 4x - 21$ be polynomials. This problem will walk you through the process of graphing the rational function $R(x) = \frac{p(x)}{q(x)}$.

(a) (5 points) What are the zeros of $p(x)$? What does this tell you about the graph of $R(x)$?

(b) (5 points) What are the zeros of $q(x)$? What does this tell you about the graph of $R(x)$?

(c) (5 points) What is the horizontal asymptote of $R(x)$?

(d) (5 points) Sketch the graph of $R(x)$ and clearly label all points and asymptotes you found in parts (a)–(c).



3. (20 points) Consider $f(x) = \ln(R(x))$, where

$$R(x) = \frac{(x+3)(2-x)}{(x-1)^2}$$

(a) (15 points) What is the domain of $f(x)$? (Hint: What is the domain of $\ln(x)$?)

(b) (5 points) Write $f(x)$ as the sum and/or difference of logarithms, and express powers as factors.

4. (20 points) Solve the following exponential and logarithmic equations (5 points each):

(a)

$$e^{x^2} = e^{3x} \cdot \frac{1}{e^2}$$

(b)

$$\log_2 8^x = -3$$

(c)

$$\log_{1/3}(x^2 + x) - \log_{1/3}(x^2 - x) = -1$$

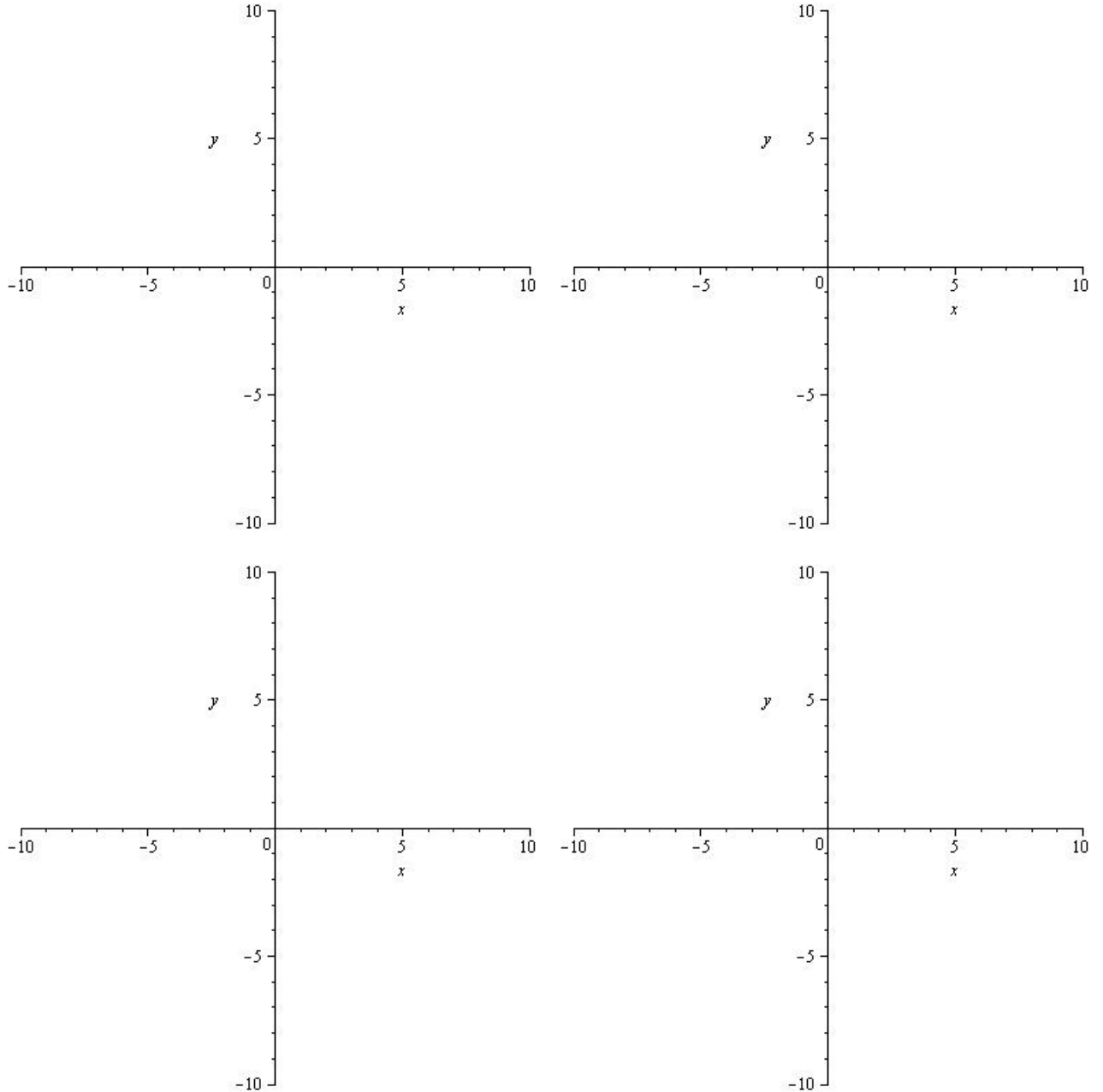
(d)

$$3 \cdot 4^x - 4 \cdot 2^x = -1$$

5. (15 points) Starting with the graph of the basic function $y = 2^x$ and showing all stages, graph the function

$$g(x) = 2^{-x-6} - 4$$

using the techniques of shifting, compressing, stretching, and/or reflecting. Label at least TWO points on each graph. ALSO, on the same axes as your final graph of $y = g(x)$, sketch the graph of $g^{-1}(x)$ and label two points on it as well.



6. (10 points) Jerome will be buying a used car for \$15,000 in three years. How much money does he need to start investing now so that, if he invests it at 5% compounded monthly, he will have enough to buy the car?