# Math 103, Fall 2014
# Week 2

In Class Work, Thursday, September 4th

## Warm Up

(a) Sketch the graph of $\ln x$.

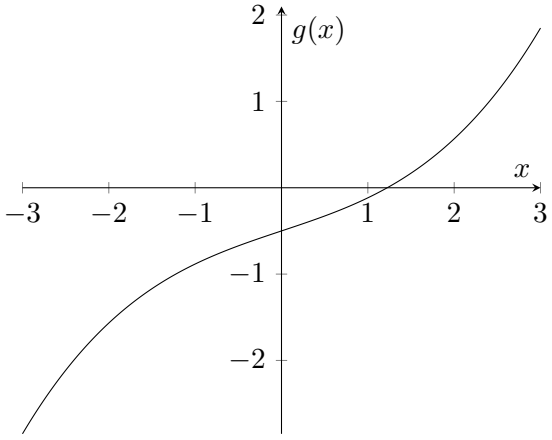
(b) Simplify each of the following expressions as much as you can:

(a) $e^{-\ln 2\pi}$

(b) $\ln 3e^2$

(c) $4 \ln \sqrt{1/e}$

(c) The following picture shows the graph of an unknown function $g(x)$:




(a) Estimate the value of $g^{-1}(1)$ (try to be within 0.2 of the correct value, which is about as accurate as is reasonable from this picture).

(b) Sketch the graph of $g^{-1}(x)$.

## Exercise 1

Consider the function $f(x) = x^5 + x^3 - 1$. If $z = f^{-1}(-1)$, what is $z$?

Finding a general expression for $f^{-1}(x)$ is hopeless, but we can still hope to find particular values of $f^{-1}$. It might help to look at the definition of being an inverse function. Make sure to check your answer by plugging it into $f$; what value should $f(z)$ have?

## Exercise 2

Find a value $c$ so that $6^x = e^{cx}$.

## Exercise 3

Someone at a different table suggests the following calculation:

$$(\ln a)^2 = 2 \ln a.$$

Writing a short argument which will convince this person that they are wrong. (It may be helpful for one person in the group to take the role of *skeptic* and argue in defense of this equation.)

## Exercise 4

$h(x)$ is an unknown function. A few values are given in the following table:

| $x$ | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| $h(x)$ | 4 | 2 | 1 | 0 | $-2$ |

(a) What is $h^{-1}(0)$?

(b) What is $h^{-1}(4)$?

## Exercise 5

Suppose $r(x) = 3x^3 + \ln x$. Solve for $x$ in the equation $r^{-1}(x) = 2$.

## Exercise 6

(a) Give a value $\theta$ such that $\sin^{-1}(\sin(\theta)) \neq \theta$.

(b) Explain why the function $\sin x$ does not have an inverse but the function $\sin^{-1} x$ *does* have an inverse.

`Once the other group at your table has answered this, swap answers with them to see if other people find your explanation clear and useful.`

## Exercise 7

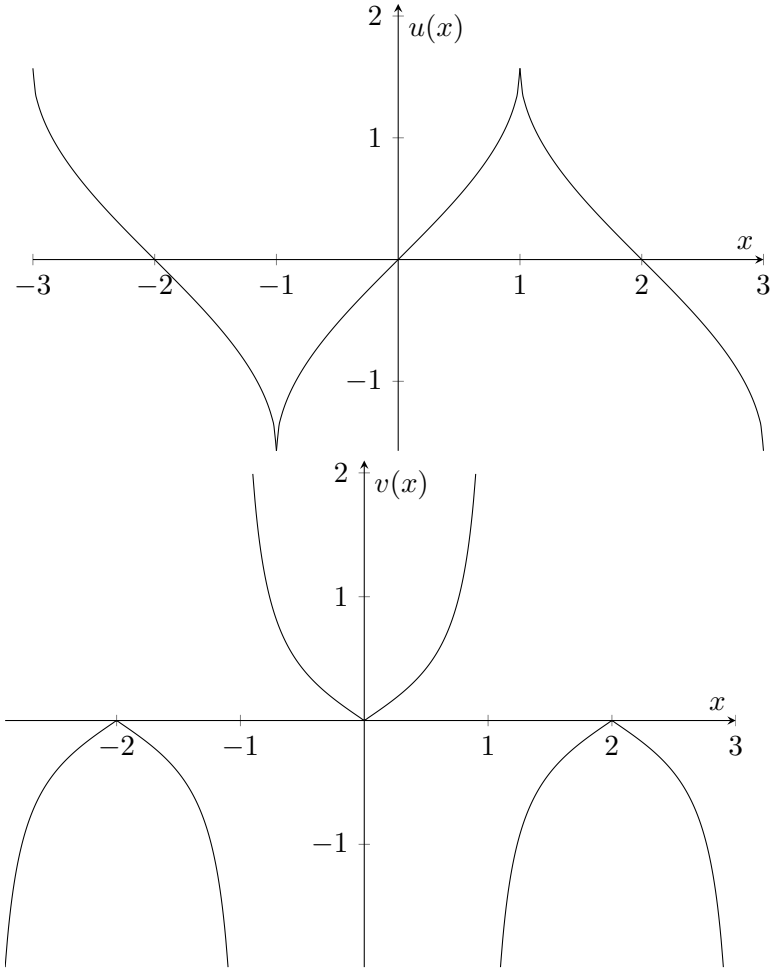
Solve the equation

$$\log_3(x+3) + \log_3(x-4) = 2$$

for $x$. (You should only get one value of $x$ as an answer.)

## Exercise 8

Consider the functions $u(x)$ and $v(x)$ shown in the following graphs:




(a) What are the domains and ranges of these functions?

(b) Which of these functions are one-to-one?

(c) For each of these functions, what is the best possible domain on which the function is one-to-one?

(d) Sketch the inverses of each function on the domain you have chosen.