1. Review of inverse functions

To find the inverse for $y = f(x)$:
(1) “solve for $x$,” get $x = g(y)$. (2) “exchange $x, y$” to get $g(x)$ - unless the problem requests $g(y)$. (3) If $f$ is one-to-one, Domain $f^{-1} = $ Image $f$

Exercise 1. Find the function inverse to $y = x^7 + 3$.

Exercise 2. Consider the function $y = \sqrt{x - 1}$ on $x \geq 1$

(a) Find the domain of $f$

(b) Show that $f$ is one-to-one

(c) Find $f^{-1}$ (in the form $x = g(y)$)

(d) Find $\frac{dy}{dx}$, $\frac{dx}{dy}$ and calculate their product

Exercise 3. Does $y = x^2$ have an inverse? Why?
2. Review of logarithms

Exercise 4. (a) \( \ln(e^{10}) = \)

(b) \( \ln(2^{100}) = \) (in terms of \( \ln 2 \))

Exercise 5. Simplify into a single logarithm:

\[
f(x) = \ln \left( \frac{10}{x^2} \right) + 2 \ln x + \ln(10 + x)
\]

Exercise 6. A variant on Moore’s law states that computing power doubles every 18 months. Suppose computers today can do \( N_0 \) operations per second.

(a) Write a formula for the future power of computers:

Computers \( t \) years from now will be able to do \( N(t) \) operations per second where

\[
N(t) =
\]

(b) A computing task would take 10 years for today’s computers. Suppose we wait 3 years and then start the computation. When will we have the answer?

(c) At what time will computers be powerful enough to compute the task in 6 months?

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