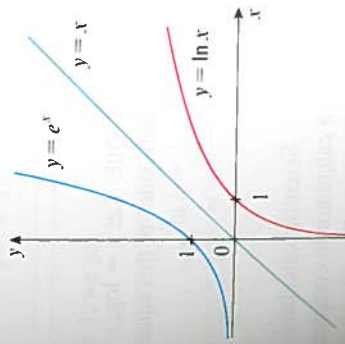


$$(5) = \frac{25}{\ln 2} (\ln 24 - \ln 5) \approx 56.58 \text{ years}$$

graphical estimate that we made in Example 3(c) in

Natural Logarithm

al function $y = e^x$ and its inverse function, the natural logarithm $y = \ln x$. Because the curve $y = e^x$ crosses the y -axis with a slope of 1, the reflected curve $y = \ln x$ crosses the x -axis with a slope of 1.

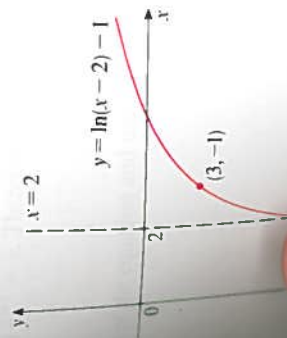


er logarithmic functions with base greater than 1, the natural logarithm function defined on $(0, \infty)$ and the y -axis is a vertical asymptote. As x of $\ln x$ become very large negative as x approaches 0.)

Natural logarithm function

$$y = \ln(x - 2) - 1.$$

the graph of $y = \ln x$ as given in Figure 13. Using the transformation, we shift it 2 units to the right to get the graph of $y = \ln(x - 2)$ and then downward to get the graph of $y = \ln(x - 2) - 1$. (See Fig-



x	1	2	5	10	50	100	1000	10,000	100,000
$\ln x$	0	0.69	1.61	2.30	3.91	4.6	6.9	9.2	11.5
$\sqrt{x}$	1	1.41	2.24	3.16	7.07	10.0	31.6	100	316
$\frac{\ln x}{\sqrt{x}}$	0	0.49	0.72	0.73	0.55	0.46	0.22	0.09	0.04

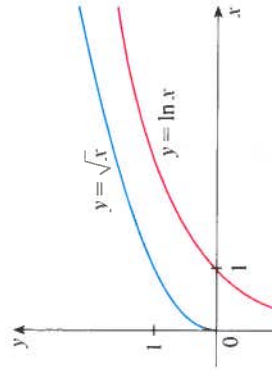


FIGURE 15

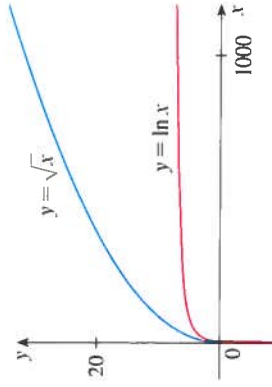


FIGURE 16

1.6 Exercises

- (a) What is a one-to-one function?
(b) How can you tell from the graph of a function whether it is one-to-one?
- (a) Suppose f is a one-to-one function with domain A and range B . How is the inverse function f^{-1} defined? What is the domain of f^{-1} ? What is the range of f^{-1} ?
(b) If you are given a formula for f , how do you find a formula for f^{-1} ?
(c) If you are given the graph of f , how do you find the graph of f^{-1} ?

3–14 A function is given by a table of values, a graph, a formula, or a verbal description. Determine whether it is one-to-one.

x	1	2	3	4	5	6
$f(x)$	1.5	2.0	3.6	5.3	2.8	2.0

x	1	2	3	4	5	6
$f(x)$	1.0	1.9	2.8	3.5	3.1	2.9

-
-
-
-
-
-
-
-
- $f(x) = x^2 - 2x$
- $f(x) = 10 - 3x$
- $g(x) = 1/x$
- $g(x) = \cos x$
- $f(t)$ is the height of a football t seconds after kickoff.
- $f(t)$ is your height at age t .