

Sec 1.6 day 1 page 69 (3-19, 21-30)

③ not 1-1 ④ 1-1 ⑤ not 1-1

⑥ 1-1 ⑦ 1-1 ⑧ not 1-1

⑨ not 1-1 ⑩ 1-1 ⑪ 1-1

⑫ not 1-1 ⑬ not 1-1 ⑭ not 1-1

⑮ $f^{-1}(9) = 2$

⑯ $f^{-1}(3) = x$ $3 = x^5 + x^3 + x$ when $x = 1$
 $\therefore f^{-1}(3) = 1$
 $f(f^{-1}(2)) = 2$

⑰ $g^{-1}(4) = x$ $4 = 3 + x + e^x$ when $x = 0$
 $\therefore g^{-1}(4) = 0$

⑱ a) because it passes the horizontal line test.

b) D of f^{-1} is R of f so D of $f^{-1} = [-1, 3]$
R of f^{-1} is D of f so R of $f^{-1} = [-3, 3]$

c) $f^{-1}(2) = 0$

d) $f^{-1}(0) \approx -1.7$

⑲ $F = \frac{9}{5}C + 32$ $F \geq -459.67$ $\frac{9}{5}C + 32 \geq -459.67$
if $C \geq -273.15$ $C \geq -273.15$

$$(21) f(x) = 1 + \sqrt{2+3x}$$

$$x = 1 + \sqrt{2+3y}$$

$$(x-1)^2 = 2+3y$$

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

$$(22) f(x) = \frac{4x-1}{2x+3} \Rightarrow x = \frac{4y-1}{2y+3}$$

$$2xy+3x = 4y-1$$

$$2xy-4y = -1-3x$$

$$y = \frac{-1-3x}{2x-4} \quad \text{or} \quad \frac{3x+1-y}{4-2x}$$

$$(23) f(x) = e^{2x-1}$$

$$x = e^{2y-1}$$

$$\ln x = 2y-1$$

$$y = \frac{\ln x + 1}{2}$$

$$* (24) y = x^2 - x \quad x \geq \frac{1}{2}$$

$$x = (y^2 - y + \frac{1}{4}) - \frac{1}{4}$$

$$x = (y - \frac{1}{2})^2 - \frac{1}{4}$$

$$\sqrt{x + \frac{1}{4}} = y - \frac{1}{2}$$

$$y = \sqrt{x + \frac{1}{4}} + \frac{1}{2}$$

$$(25) y = \ln(x+3)$$

$$x = \ln(y+3)$$

$$e^x = y+3$$

$$y = e^x - 3$$

$$(26) y = \frac{e^x}{1+2e^x}$$

$$x = \frac{e^y}{1+2e^y}$$

$$x + 2e^y x = e^y$$

$$x = e^y - 2e^y x$$

$$x = e^y (1 - 2x)$$

$$\frac{x}{1-2x} = e^y \Rightarrow \ln x - \ln(1-2x) = y$$

$$(27) f(x) = x^4 + 1$$

$$x = y^4 + 1$$

$$x - 1 = y^4$$

$$f^{-1}(x) = \sqrt[4]{x-1}$$

$$(28) f(x) = 2 - e^x$$

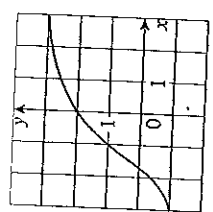
$$x = 2 - e^y$$

$$\ln e^y = \ln(2-x)$$

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

$$f^{-1}(x) = \ln(2-x)$$

29 - 30 see copy



19. The formula $C = \frac{5}{9}(F - 32)$, where $F \geq -459.67$, expresses the Celsius temperature C as a function of the Fahrenheit temperature F . Find a formula for the inverse function and interpret it. What is the domain of the inverse function?

20. In the theory of relativity, the mass of a particle with speed v is

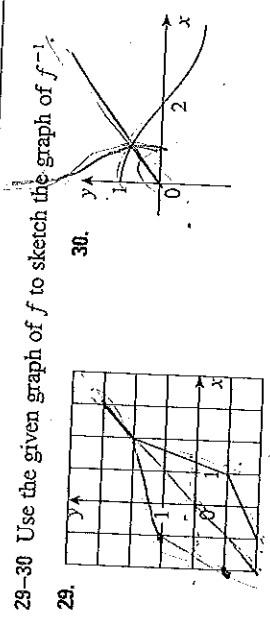
$$m = f(v) = \frac{m_0}{\sqrt{1 - v^2/c^2}}$$

where m_0 is the rest mass of the particle and c is the speed of light in a vacuum. Find the inverse function of f and explain its meaning.

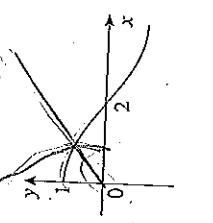
- 21-26 Find a formula for the inverse of the function.
21. $f(x) = 1 + \sqrt{2 + 3x}$ 22. $f(x) = \frac{4x - 1}{2x + 3}$
23. $f(x) = e^{2x-1}$ 24. $y = x^2 - x, \quad x \geq \frac{1}{2}$
25. $y = \ln(x + 3)$ 26. $y = \frac{e^x}{1 + 2e^x}$

- 27-28 Find an explicit formula for f^{-1} and use it to graph f^{-1} , f , and the line $y = x$ on the same screen. To check your work, see whether the graphs of f and f^{-1} are reflections about the line.

27. $f(x) = x^4 + 1, \quad x \geq 0$ 28. $f(x) = 2 - e^x$



- 29-30 Use the given graph of f to sketch the graph of f^{-1} .
- 29.



- 30.

(v) Describe the general shape of the graph of the function $y = \log_e x$ if $a > 1$.

34. (a) What is the natural logarithm?
 (b) What is the common logarithm?
 (c) Sketch the graphs of the natural logarithm function and the natural exponential function with a common set of axes.

- 35-38 Find the exact value of each expression.

35. (a) $\log_5 125$ (b) $\log_3 \left(\frac{1}{27}\right)$
36. (a) $\ln(1/e)$ (b) $\log_{10} \sqrt{10}$
37. (a) $\log_2 6 - \log_2 15 + \log_2 20$
 (b) $\log_3 100 - \log_3 18 - \log_3 50$
38. (a) $e^{-2 \ln 5}$ (b) $\ln(\ln e^{e^e})$

- 39-41 Express the given quantity as a single logarithm.

39. $\ln 5 + 5 \ln 3$
40. $\ln(a + b) + \ln(a - b) - 2 \ln c$
41. $\ln(1 + x^2) + \frac{1}{2} \ln x - \ln \sin x$

42. Use Formula 10 to evaluate each logarithm correct to six decimal places.
- (a) $\log_{12} 10$ (b) $\log_2 8.4$

- 43-44 Use Formula 10 to graph the given functions on a common screen. How are these graphs related?

43. $y = \log_{1.5} x, \quad y = \ln x, \quad y = \log_{10} x, \quad y = \log_{50} x$
44. $y = \ln x, \quad y = \log_{10} x, \quad y = e^x, \quad y = 10^x$

45. Suppose that the graph of $y = \log_2 x$ is drawn on a coordinate grid where the unit of measurement is an inch. How many miles to the right of the origin do we have to move before the height of the curve reaches 3 ft?

46. Compare the functions $f(x) = x^{0.1}$ and $g(x) = \ln x$ by graphing both f and g in several viewing rectangles. When does the graph of f finally surpass the graph of g ?

- 47-48 Make a rough sketch of the graph of each function. Do not use a calculator. Just use the graphs given in Figures 12 and 13 and, if necessary, the transformations of Section 1.3.

47. (a) $y = \log_{10}(x + 5)$ (b) $y = -\ln x$

52. (a) $\ln(\ln x) = 1$
- 53-54 Solve each inequality.
53. (a) $e^x < 10$
54. (a) $2 < \ln x < 9$

- 55-56 Find (a) the domain and (b) the range of the function.
55. $f(x) = \sqrt{3 - e^{2x}}$

57. Graph the function $f(x) = \ln(x^2 + 1)$ and explain why it is one-to-one. To find an explicit formula for f^{-1} , produce three possible candidates and show that they are irrelevant in the domain of f .
58. (a) If $g(x) = x^6 + 1$, find an explicit formula for $g^{-1}(x)$.
 (b) Use the expression $y = g^{-1}(x)$ to find an explicit formula for $x = g^{-1}(y)$.

17 Parametric Equations and Polar Coordinates

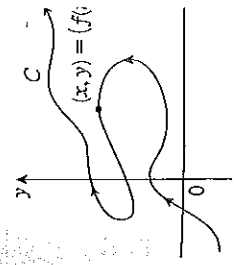


FIGURE 1