

**EXPLORATION BIT**

Demonstrate that  $x^x$  is real when  $x$  is any negative integer. Demonstrate that  $x^x$  is real when  $x$  is any negative rational number  $p/q$ , where  $p/q$  is in reduced form and  $q$  is odd. Demonstrate the difficulty that arises for some rational numbers that do not meet this restriction.

**EXPLORATION 4****Confirm Analytically**

Let  $y_1 = x^x$ .

1. GRAPH  $y_1$  so that some points are graphed for  $x < 0$ . (This requires that you set [xMin, xMax] in a certain way, as suggested by Exercises 35–40 of Section 1.1.)

Draw a complete graph of the functions  $g$  and  $h$ . Use what you know about the complete graph of  $y_1$  to support the completeness of the graphs of  $g$  and  $h$ . Then confirm analytically that your graphs are complete.

2.  $g(x) = |x|^x$
3.  $h(x) = |x|^{|x|}$

**Exercises 7.3**

In Exercises 1–24, find  $dy/dx$ .

1.  $y = x^\pi$
2.  $y = x^{1+\sqrt{2}}$
3.  $y = x^{-\sqrt{2}}$
4.  $y = x^{1-e}$
5.  $y = 8^x$
6.  $y = 9^{-x}$
7.  $y = 3^{\csc x}$
8.  $y = 3^{\cot x}$
9.  $y = x^{\ln x}, x > 0$
10.  $y = x^{(1/\ln x)}$
11.  $y = (x+1)^x$
12.  $y = (x+2)^{x+2}$
13.  $y = x^{\sin x}$
14.  $y = (\sin x)^{\tan x}$
15.  $y = \log_4 x^2$
16.  $y = \log_5 \sqrt{x}$
17.  $y = \log_2(3x+1)$
18.  $y = \log_{10} \sqrt{x+1}$
19.  $y = \log_2(1/x)$
20.  $y = 1/\log_2 x$
21.  $y = \ln 2 \cdot \log_2 x$
22.  $y = \log_3(1+x \ln 3)$
23.  $y = \log_{10} e^x$
24.  $y = \ln 10^x$

Evaluate the integrals in Exercises 25–40 analytically and with a NINT computation.

25.  $\int_0^1 3x^{\sqrt{3}} dx$
26.  $\int_0^1 x^{\sqrt{2}} dx$
27.  $\int_0^1 5^x dx$
28.  $\int_1^e x^{\ln 2 - 1} dx$
29.  $\int_0^1 \frac{1}{2^x} dx$
30.  $\int_{-1}^1 2^{(x+1)} dx$
31.  $\int_{-1}^0 4^{-x} \ln 2 dx$
32.  $\int_{-2}^0 5^{-x} dx$
33.  $\int_1^{\sqrt{2}} x 2^{x^2} dx$
34.  $\int_0^{\pi/2} 2^{\cos x} \sin x dx$
35.  $\int_1^{10} \frac{\log_{10} x}{x} dx$
36.  $\int_1^4 \frac{\log_2 x}{x} dx$
37.  $\int_0^2 \frac{\log_2(x+2)}{x+2} dx$
38.  $\int_{1/10}^{10} \frac{\log_{10}(10x)}{x} dx$
39.  $\int_0^9 \frac{2 \log_{10}(x+1)}{x+1} dx$
40.  $\int_2^3 \frac{2 \log_2(x-1)}{x-1} dx$