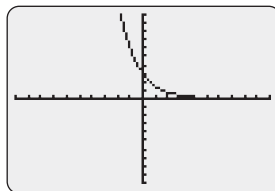
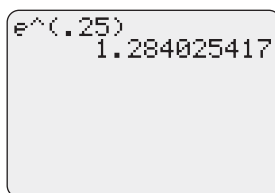


Notice that only the fraction  $\frac{1}{2}$  is being raised to the exponent, so we put it in parentheses. The graph looks like



Later, we will learn about the irrational number,  $e$ , which is used often in exponential equations. To calculate or input a value such as  $e^{0.25}$  into a graphing calculator, type **2nd** **LN**. Then, type in the exponent, 0.25, and close the parentheses by pressing **)**. Then press **ENTER**:



## 4.1 EXERCISES

### PRACTICE

Sketch the graphs of the following functions. State their domain and range. See Examples 1 and 2.

1.  $f(x) = 4^x$

2.  $g(x) = (0.5)^x$

3.  $s(x) = 3^{x-2}$

4.  $f(x) = \left(\frac{1}{3}\right)^{x+1}$

5.  $r(x) = 5^{x-2} + 3$

6.  $h(x) = 1 - 2^{x+1}$

7.  $f(x) = 2^{-x}$

8.  $r(x) = 3^{2-x}$

9.  $g(x) = 3(2^{-x})$

10.  $h(x) = 2^{2x}$

11.  $s(x) = (0.2)^{-x}$

12.  $f(x) = \frac{1}{2^x} + 1$

13.  $g(x) = 3 - 2^{-x}$

14.  $r(x) = \frac{1}{2^{3-x}}$

15.  $h(x) = \left(\frac{1}{2}\right)^{5-x}$

16.  $m(x) = 3^{2x+1}$

17.  $p(x) = 2 - 4^{2-x}$

18.  $q(x) = 5^{3-2x}$

19.  $r(x) = \left(\frac{9}{2}\right)^{-x}$

20.  $p(x) = \left(\frac{1}{3}\right)^{2-x}$

21.  $r(x) = 1 - \left(\frac{15}{4}\right)^x$

Solve the following exponential equations. See Example 3.

22.  $5^x = 125$

23.  $3^{2x-1} = 27$

24.  $9^{2x-5} = 27^{x-2}$

25.  $10^x = 0.01$

26.  $4^{-x} = 16$

27.  $2^x = \left(\frac{1}{2}\right)^{13}$

28.  $2^{x+1} = 64^3$

29.  $\left(\frac{2}{3}\right)^{x+3} = \left(\frac{9}{4}\right)^{-x}$

30.  $\left(\frac{1}{5}\right)^{x-4} = 625^{\frac{1}{2}}$

31.  $4^{3x+2} = \left(\frac{1}{4}\right)^{-2x}$

32.  $5^x = 0.2$

33.  $7^{x^2+3x} = \frac{1}{49}$

34.  $3^{x^2+4x} = 81^{-1}$

35.  $\left(\frac{1}{2}\right)^{x-3} = \left(\frac{1}{4}\right)^{x-5}$

36.  $64^{x+\frac{7}{6}} = 2$

37.  $6^{2x} = 36^{2x-3}$

38.  $4^{2x-5} = 8^{\frac{x}{2}}$

39.  $\left(\frac{2}{5}\right)^{2x+4} = \left(\frac{4}{25}\right)^{11}$

40.  $4^{4x-7} = \frac{1}{64}$

41.  $-10^x = -0.001$

42.  $3^x = 27^{x+4}$

43.  $1000^{-x} = 10^{x-8}$

44.  $1^{3x-7} = 4^{2-x}$

45.  $5^{3x-1} = 625^x$

46.  $3^{2x-7} = 81^{\frac{x}{2}}$

Match the graphs of the following functions to the appropriate equation.

47.  $f(x) = 2^{3x}$

48.  $h(x) = 5^x - 1$

49.  $g(x) = 2(4^{x-1})$

50.  $p(x) = 1 - 2^{-x}$

51.  $f(x) = 6^{4-x}$

52.  $r(x) = \frac{1}{3^x}$

53.  $m(x) = -2 + 2^{-3x}$

54.  $g(x) = \left(\frac{1}{4}\right)^{1+x}$

55.  $h(x) = 3^{\frac{1}{2}x}$

56.  $s(x) = 1^x - 4$

