

## Section 1.2 Mathematical Models: A Catalog of Essential Functions

2. Classify each function as a power function, root function, polynomial (state its degree), rational function, algebraic function, trigonometric function, exponential function, or logarithmic function.

(a)  $f(t) = \frac{3t^2+2}{t}$  (b)  $h(r) = 2.3^r$  (c)  $s(t) = \sqrt{t+4}$  (d)  $y = x^4 + 5$  (e)  $g(x) = \sqrt[3]{x}$  (f)  $y = \frac{1}{x^2}$

**Solution:**

(a)  $f(t) = \frac{3t^2+2}{t}$  is a rational function. (This function is also an algebraic function.)

(b)  $h(r) = 2.3^r$  is an exponential function.

(c)  $s(t) = \sqrt{t+4}$  is an algebraic function. It is a root of a polynomial.

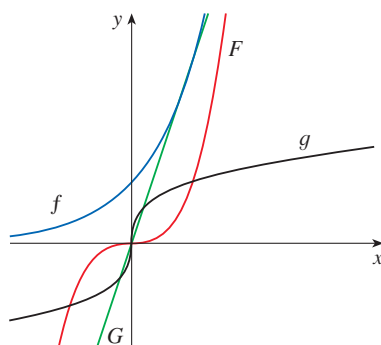
(d)  $y = x^4 + 5$  is a polynomial function of degree 4.

(e)  $g(x) = \sqrt[3]{x}$  is a root function. Rewriting  $g(x)$  as  $x^{1/3}$ , we recognize the function also as a power function. (This function is, further, an algebraic function because it is a root of a polynomial.)

(f)  $y = \frac{1}{x^2}$  is a rational function. Rewriting  $y$  as  $x^{-2}$ , we recognize the function also as a power function. (This function is, further, an algebraic function because it is the quotient of two polynomials.)

4. Match each equation with its graph. Explain your choices. (Don't use a computer or graphing calculator.)

(a)  $y = 3x$  (b)  $y = 3^x$  (c)  $y = x^3$  (d)  $y = \sqrt[3]{x}$



**Solution:**

(a) The graph of  $y = 3x$  is a line (choice  $G$ ).

(b)  $y = 3^x$  is an exponential function (choice  $f$ ).

(c)  $y = x^3$  is an odd polynomial function or power function (choice  $F$ ).

(d)  $y = \sqrt[3]{x} = x^{1/3}$  is a root function (choice  $g$ ).