Composition

1. (a) Suppose $f(x) = x^2 + 1$ and $g(x) = 2x - 1$. Write simplified expressions for $f(g(x))$ and $g(f(x))$.

   (b) Suppose $f(x) = \dfrac{1}{x}$ and $g(x) = \dfrac{1}{x^2 + 1}$. Write simplified expressions for $f(g(x))$ and $g(f(x))$.

   (c) Suppose $f(x) = \frac{1}{x^2}$ and $g(x) = \sqrt{x^2 + x}$. Write simplified expressions for $f(g(x))$ and $g(f(x))$.

   (d) Suppose $f(x) = \dfrac{x+1}{x-1}$. Write a simplified expression for $f(f(x))$.

   (e) Suppose $f(x) = \sqrt{x+1}$ and $g(f(x)) = \dfrac{1}{3x+1}$. Find an expression for $g(x)$.

   (f) Suppose $f(x) = x + 1$ and $g(f(x)) = \dfrac{1}{x^2 - 1}$. Find an expression for $g(x)$.

2. Let $f(x) = x^2 - 4$ and let $g(x) = \sqrt{x}$. Find the domain of the function $h(x) = g(f(x))$.

3. The table below contains certain values of the functions h and k. Fill in the table with values for the function $g(x) = h(k(x))$.

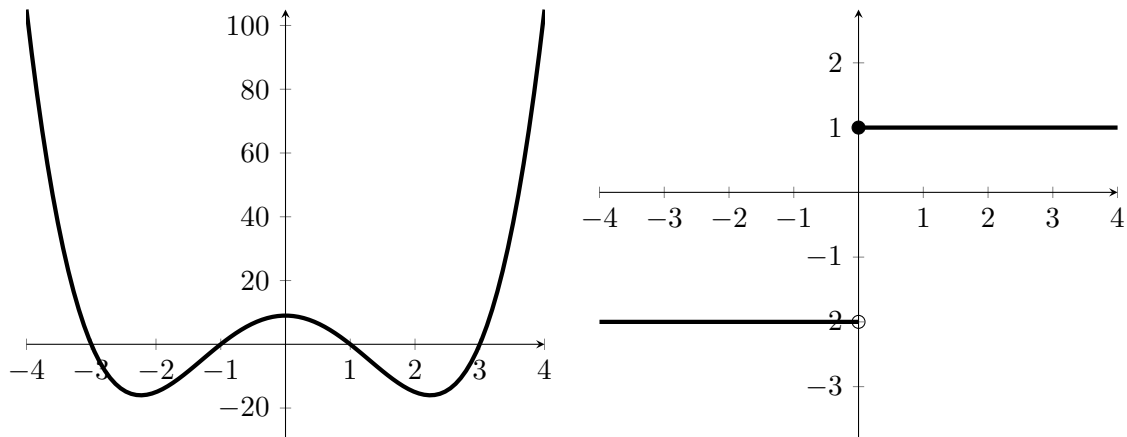| x	-2	-1	0	1	2	3
$k(x)$	1	0	3	-2	2	-1
$h(x)$	-3	-2	-1	5	7	2
$g(x)$						

4. (a) Let $T(t)$ be the average daily temperature (°F) in Durham, North Carolina, at time t (days from January 1). Let $E(x)$ be the amount of electricity used (kilowatts) by the residents of Durham when the average daily temperature is x degrees. Describe the meaning of the function $G(t) = E(T(t))$ in practical terms. Include units in your answer.

(b) Let $v(t)$ be the speed (meters per second) of a marathon runner t minutes from the start of the race. Let $O(x)$ be the amount of oxygen (liters/min) required by this runner to maintain a speed of x meters per second. Explain the meaning of the function $f(t) = O(v(t))$ in practical terms. Include units in your answer.

(c) Let $L(e)$ be the life expectancy (years) of a person with e years of education. Let $E(i)$ be the average number of years of education obtained by people whose parents have an average annual income of i dollars. Describe the function $f(i) = L(E(i))$ in practical terms. Include units in your answer.

5. The graphs of the functions f and g are given below. Sketch the graphs of $f(g(x))$ and $g(f(x))$.

Report

Submit all questions.