Section 1.3 Representations of Functions

Problem 1.

(a) (a) Function. Domain: $[-4, 5]$. Range: $[-.2, .9]$.

(b) Not a function.

(c) Function. Domain: $(-3, 7]$. Range: $[0, 3]$.

(d) Function. Domain: $\{-3, -2, -1, 0, 1, 2, 3, 4\}$. Range: $\{-1, 0, 1\}$.

(e) Not a function.

(f) Function. Domain: $\{0, 1, 2, 3, 4\}$. Range: $\{1\}$.

(g) Function. Domain: $(-\infty, \infty)$. Range: $[0, \infty)$.

(h) Function. Domain: $[-1, 3)$. Range: $\{-1, 0, 1, 2\}$.

(i) Function. Domain: $[-2, 0) \cup (0, 2]$. Range: $(-\infty, \infty)$.

(b) None of the functions above is 1–to–1.

Problem 6.

(a) $-2 \leq x \leq 3$,

(b) no

(c) highest value at $x = -3$, lowest value at $x = -5$

(d) 3

(e) -2

(f) $x = -4$, $x = -1$, $x = 2$, $x = 3$

(g) -1

(h) 0

(i) $g(\pi) \approx 0.2$, $g(-\pi) \approx -2.8$

(j) $x \approx -3.9$, $x \approx -1.3$, $x \approx 2.8$

(k) $-5 \leq x \leq -4.8$

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Problem 14.

(a) yes

(b) yes

(c) no

(d) no

(e) no

(f) yes

(g) no

Problem 15.
e.g. f like in problem 14f, g like in problem 14b.

Problem 32.
Using the condition that $h(0) = g(0)$ and that the dashed graph and the increasing solid graph are the only two graphs that meet at $x = 0$, these graphs are the graphs h and g. Using the second condition that $h(x) > g(x)$ for $x < 0$, we conclude that the dashed graph is the graph of h and the increasing solid graph is the graph of g. Hence the dashed and dotted graph and the other solid graph are the graphs of f and j. Notice that $f(x) \leq 0$ and $j(x) \leq 0$ for $x > 0$. The fourth condition that $j(x) = 2f(x)$ for $x > 0$ implies that $j(x) \leq f(x)$ for $x > 0$, from which we conclude that the dashed and dotted graph to be the graph of j, which lies below the graph of f and the remaining graph to be that of f. (Although the third condition is consistent with other conditions and the graphs, it is superfluous.)

Problem 46.
We use the distance formula $d = rt$, which expresses the distance d traveled at a constant rate r for a time period of duration t in terms of r and t. The commuter first bikes to the train station at a rate of B miles per hour. He travels X miles, so the ride takes $\frac{X}{B}$ hours. Next, the commuter waits w hours for the subway. The subway ride takes R minutes or $\frac{R}{60}$ hours. Finally, the commuter walks Y miles at $\frac{M}{H}$ miles per hour, taking $\frac{YH}{M}$ hours. Let $T(w)$ be the total time of the commute as a function of w. Adding the durations of the individual stages of the commute, we can express the total time of the commute as $T(w) = \frac{Y}{B} + w + \frac{R}{60} + \frac{YH}{M}$ hours.