3 Math101 answers

3.1 The answers are:: $f(-1) = 2$ and $f(2) = 17$.

3.2 The answers are:

- No since then $f(0)$ would be equal to both 2 and 0.
- $f_+(x) = 1 + \sqrt{1 - x^2}$.
- $f_-(x) = 1 - \sqrt{1 - x^2}$

3.3 The answer is $(f \circ g)(x) = x$.

3.4 The answers are:

$$D(f) = \mathbb{R} \setminus \{1\}, \qquad D(g) = \mathbb{R} \setminus \{-1, 1\}, \qquad D(h) = [\frac{3}{2}, \infty[.$$

3.5 The answers are $(f \circ g)(1) = \frac{\sqrt{2}}{2}$ and $(g \circ f)(1) = \frac{1}{2}$, hence $f \circ g \neq g \circ f$

3.6 The point of intersection is $(\frac{1}{4}, \frac{7}{4})$.

3.7 The answers are $(f \circ g)(x) = 1$ and $(g \circ f)(x) = 5$.

3.8 The answers are:

$$D(f) = \mathbb{R}, \qquad D(g) = \mathbb{R} \setminus \{1, 3\}, \qquad D(h) = [0, 2].$$

3.9 Choose $f(x) = e^x$ and $g(x) = 2x^2 - 1$.

3.10 The point of intersection is $(-1, 1)$.

3.11 Choose $f(x) = x^2$, $g(x) = \sin(x)$ and $h(x) = 3x$.

3.12 The answers are:

$$f(g(x)) = \frac{3x^2}{(1 - 2x)^2}, \qquad f(h(x)) = \frac{3}{x}, \quad h(g(x)) = \frac{1}{\sqrt{x}} + 2,$$
$$h(f(x)) = \sqrt{3}\frac{1}{x - 2} + 2, \quad g(f(h(x))) = \frac{x}{3}.$$

3.13 No.

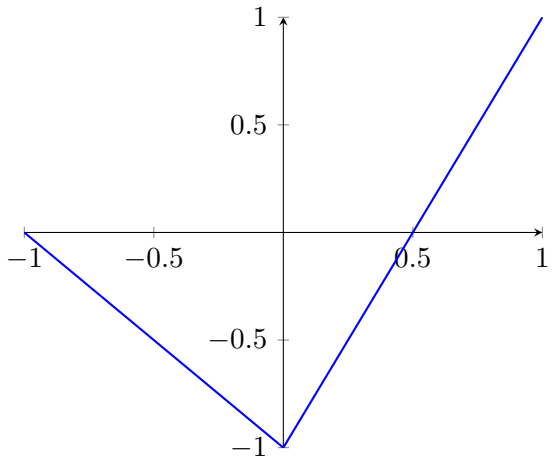
3.14 In Figure 1 is sketched a function which satisfies:

3.14(a) has domain $[-1, 1]$,

3.14(b) intersects the points $(-1, 0)$ and $(1, 1)$,

3.14(c) intersects the y-axis at -1.

Note that many other functions satisfy these conditions.



Figur 1: Exercise 3.14.