Homework of Further Mathematics
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1. What are domains of following functions? (I can't delete this otherwise it comes error)

   $(1) y = \sin\sqrt{x}$

   $(2) y = \arcsin(x-3)$

   $(3) y = \sqrt{3-x} + \arctan\frac{1}{x}$

   > **Ans:**
   >
   > $(1) x \subset [0, +\infty)$
   >
   > $(2) x \subset [2, 4]$
   >
   > $(3) x \subset (-\infty, 3] \setminus \{0\}$

2. Let

$$f(x) = \begin{cases} 1 & \text{for} & |x| < 1 \\ 0 & \text{for} & |x| = 1 \\ -1 & \text{for} & |x| > 1 \end{cases}, g(x) = e^x,$$

   and answer following questions:

   (a) What are $f[g(x)]$ and $g[f(x)]$?

   (b) Draw graphics of them.

   > **Ans:**
   >
   > (a) $f[g(x)] = \begin{cases} 1 & \text{for} & x < 0 \\ 0 & \text{for} & x = 0 \\ -1 & \text{for} & x > 0 \end{cases}$,
   >
   > $g[f(x)] = \begin{cases} e & \text{for} & -1 < x < 1 \\ 1 & \text{for} & x = \pm 1 \\ e^{-1} & \text{for} & x < -1 \text{ or } x > 1 \end{cases}$
   >
   > (b) I have not learnt to draw with LaTex yet, so I draw them by hands.