1. Let $f$ be the function graphed below:

![Graph of the function $f$](image)

a. Does $f$ have an inverse in the domain of $[-4, 4]$? Ans. No. The function $f$ violates the horizontal line test.

b. If we restrict the domain of $f$ to be $[-2, 2]$, does $f^{-1}$ exist? Yes, if you restrict the domain to $[-2, 2]$, then the function passes the horizontal line test.

c. If $f(-2) = 1, f(-1) = 3$ and $f(2) = 7$, find $f^{-1}(1), f^{-1}(3)$ and $f^{-1}(7)$.

[Ans. $f^{-1}(1) = -2, f^{-1}(3) = -1$ and $f^{-1}(7) = 2$.]

2. If $f(x) = -\sqrt{x - 2} + 1$

a. Does $f^{-1}$ exist? [Ans. Yes]

b. Find the inverse of $f$: $f^{-1}(x) = (x - 1)^2 + 2, x \leq 1$

c. Sketch $y = f(x)$ and $y = f^{-1}(x)$ together if $f^{-1}$ exists; otherwise sketch $y = f(x)$ only.

3. If $h(x) = (3x - 1)^{-2}$, find two functions $f$ and $g$ so that $h = f \circ g$. [Ans. $g(x) = (3x - 1), f(x) = x^{-2}$]

4. If $h(x) = \sqrt{3x - 1}$, find two functions $f$ and $g$ so that $h = f \circ g$. [Ans. $g(x) = 3x - 1$ and $f(x) = \sqrt{x}$]

5. Suppose $f(x) = \sqrt{x}$.
a. Find the function $g$ so that $y = g(x)$ is a reflection of $f$ with respect to $y$-axis. [Ans. $g(x) = \sqrt{-x}$.]

b. Find the inverse function for $g$. [$g^{-1}(x) = -x^2, x \geq 0$.]

c. Graph the functions $g$ and $g^{-1}$ together.

6. If $f(x) = \frac{3}{5}x - 1$, [done in class].
   a. explain why $f$ has an inverse function..
   b. find the inverse function, $f^{-1}$,
   c. check if $f(f^{-1}(x)) = f^{-1}(f(x)) = x,$
   d. graph $f$, and $f^{-1}$ together.

7. If $f(x) = \sqrt{x + 1}$ and $g(x) = 2x^2 - 3$. Find
   a. $(f \circ g)(1) = f(g(1)) = 0$
   b. $(g \circ f)(1) = g(f(1)) = 1$
   c. $(f \cdot g)(1) = f(1)g(1) = -\sqrt{2}$

8. Let $f(x) = x^3$,
   a. find the function $g$ so that $y = g(x)$ is a reflection of $f$ with respect to the $x$-axis; [ans. $g(x) = -x^3$]
   b. find the function $h$ so that $y = h(x)$ is a shifting of $y = f(x)$ left 3 units and down 3 units. [$h(x) = (x + 3)^3 - 3$]
   c. does $h$ have an inverse? If so, sketch $y = h(x)$ and $y = h^{-1}(x)$ together. [$h^{-1}(x) = (x + 3)^{\frac{1}{3}} - 3$].