# Exercise 328

For the following problems, determine the largest domain on which the function is one-to-one and find the inverse on that domain.

$$f(x) = \sqrt{9 - x}$$

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**Solution**

To find the domain, use the fact that the number under the square root cannot be negative.

$$9 - x \geq 0$$

$$-x \geq -9$$

$$x \leq 9$$

The domain is therefore $\{x \mid x \leq 9\}$. The square root passes the horizontal line test, so an inverse function exists. Replace $x$ with $y$, and replace $f(x)$ with $x$ in the equation.

$$x = \sqrt{9 - y}$$

Square both sides.

$$x^2 = 9 - y$$

Solve for $y$, the inverse function.

$$y = 9 - x^2$$

Graphing the function and its inverse over the domain, we see that they are mirror images over the line $y = x$, which is expected.