$f : A \to B$ is onto iff $f(A) = B$.

$f : A \to B$ is onto iff $b \in B$ implies there exists an $a \in A$ such that $f(a) = b$.

$f : A \to B$ is onto iff for all $b \in B$, there exists an $a \in A$ such that $f(a) = b$.

$f : A \to B$ is NOT onto iff there exists $b \in B$ s. t. there does not exist an $a \in A$ s. t. $f(a) = b$.

Determine if the following functions are onto. Prove it.

1.) $f : R \to R,\ f(x) = x^2$

2.) $f : [0, \infty) \to R,\ f(x) = x^2$

3.) $f : [0, \infty) \to [0, \infty),\ f(x) = x^2$

4.) $f : R \to R,\ f(x) = x^3$

5.) $f : R \to R,\ f(x) = 2$

6.) $f : R \to R,\ f(x) = 8x + 2$

7.) $f : R \to R,\ f(x) = x^2 + 3x$

8.) $f : R \to R,\ f(x) = e^x$

9.) $f : R \to R,\ f(x) = x^4 + x^2$

10.) $f : R \to R,\ f(x) = sin(x)$