5) - We will start by assuming that any integer n can be expressed as $\boxed{1}$ $3k-1$, or $\boxed{2}$ $3k$ or, $\boxed{3}$ $3k+1$. We will prove that $\boxed{2}$ can be a power of 3.

base case (k = Inductive proof of $\boxed{2}$ being a power of 3

(a) base case: $k = 1$

$3k \Rightarrow 3(1) = 3^1$ ← a power of 3

* Note $k = 3k$ and $k = a_0 3^0 + a_1 3^1 \dots + a_s 3^s$ (for some int s and $a \in \{-1,0,1\}$

(b) inductive hypothesis: for any k, $z = k$ such that $3z$ is a power of 3

(c) inductive step $(z+1)$:

$3(z+1) \Rightarrow 3z + 3^1$ ← $3z$ is a power of 3 so replace with definition

(as 3z ... a power of 3) $\Rightarrow 3(a_0 3^0 + a_1 3^1 + a_2 3^2 + \dots + a_{s-1} 3^{s-1} + a_s 3^s)$ ($a \in [-1,0,1]$ and some int s)

$\Rightarrow a_0 3^1 + a_1 3^2 + a_2 3^3 + \dots + a_{s-1} 3^s + a_s 3^{s+1} + 3^1$

$\Rightarrow (1 + a_0) 3^1 + a_1 3^2 + a_2 3^3 + \dots + a_{s-1} 3^s + a_s 3^{s+1}$

$(z \in [0,2] \Rightarrow [0,2]$

∴ for any a_b, where $0 \le b \le s$, we have 4 cases:

- $(1 + a_0)$ has the interval $z[0,2]$

Case 1: $a_b = -1$ | Case 2: $a_b = 0$ or $a_b + 1$ $(a_b = -1)$ | Case 3: $a_b = 1$ or $a_b + 1$ $(a_b = 0)$

* in this case a_b remains being -1 | * in this case a_b becomes 0 | * in this case a_b becomes 1

Case 4: $a_b = 1$ and $a_b + 1$:

$(a_b + 1) 3^b \Rightarrow (a_b) 3^{b+1} - a_b 3^b$

$\Rightarrow 3^{b+1} - 3^b$

- This applies recursively for every a_i until any $3(z+1)$ can be expressed as

after each case n_0, n_1, n_2 will be in the interval $[-1, 0, 1]$,
so for all $3(K+1)$:

$$3(K+1) = n_0 3^1 + n_1 3^2 + n_2 3^3 \dots + n_s 3^{s+1} + \dots$$

(for some $s \in \mathbb{Z}$ and $n \in [-1, 0, 1]$) maybe if case

$\therefore$ We have shown that if a number is of the form $3K$ it is a power of 3, or

$\boxed{1}$ Proving $3K-1$:

$$3K-1 \Rightarrow 3(a_0 3^0 + a_1 3^1 + a_2 3^2 + \dots + a_{s-1} 3^{s-1} + a_s 3^s) - 1 \quad (\text{for some } s,\ a \in [-1, 0, 1])$$
$$\Rightarrow (a_0 3^1 + a_1 3^2 + a_2 3^2 + \dots + a_{s-1} 3^{s-1} + a_s 3^{s+1}) - 3^0$$
$$\Rightarrow -1\, 3^0 + a_0 3^1 + a_1 3^2 + a_2 3^2 + \dots + a_{s-1} 3^s + a_s 3^{s+1}$$

- Since for any a, the interval of $a \in [-1, 0, 1]$ it is a power of 3

$\boxed{2}$ Proving $3K+1$

$$3K+1 \Rightarrow 3(a_0 3^0 + a_1 3^1 + a_2 3^2 + \dots + a_s 3^s) + 1 \quad (\text{for some } s,\ a \in [-1, 0, 1])$$
$$\Rightarrow a_0 3^1 + a_1 3^2 + a_2 3^3 + \dots + a_s 3^{s+1} + 3^0$$
$$\Rightarrow 3^0 + a_0 3^1 + a_1 3^2 + a_2 3^3 + \dots + 3^{s+1}$$

$\therefore$ Since for any a the interval of $a \in [-1, 0, 1]$ then any $3K+1$ is a power of 3

Since every number falls into $\boxed{1}$, $\boxed{2}$ or $\boxed{3}$, and since any $\boxed{1}$, $\boxed{2}$ or $\boxed{3}$ is a power of 3, then every positive number is a power of 3