Q5) We will use Proof by Strong induction to prove the statement:

$\boxed{1}$ base cases (0 - 1): $Y_0 = 5^0 - (-2)^0$ and $Y_1 = 5^1 - (-2)^1$

$Y_0 = 1 - 1$ $\quad$ $Y_1 = 5 + 2$

* from definition: $\Rightarrow$ $0 = 0$ $\quad$ * from definition $\Rightarrow 7 = 7$

$(Y_0 = 0)$ $\quad$ $(Y_1 = 7)$

$\boxed{2}$ Inductive Step: $\forall i \in \mathbb{Z}$, $(2 \leq i \leq j)$ such that any:

$$Y_i = 5^i - (-2)^i \qquad (j \in \mathbb{Z},\ j \geq 2)$$

"from question"

$\boxed{3}$ NTP: $Y_{j+1} = 5^{j+1} - (-2)^{j+1}$

LHS $= Y_{j+1}$ $\qquad$ RHS $= 5^{j+1} - (-2)$

$= 3(Y_{(j+1)-1}) + 10(Y_{(j+1)-2})$ ← from recursive sequence

$= 3(Y_j) + 10(Y_{j-1})$

$= 3(5^j - (-2)^j) + 10(5^{j-1} - (-2)^{j-1})$ ← from inductive step $\boxed{2}$

$= 3\cdot5^j + 10\,5^{j-1} - 3(-2)^j - 10(-2)^{j-1}$

$= 3\cdot5^j + 2\,10\cdot(5)^{-1}\cdot5^j - 3(-2)^j - 10\,(-2)^{-1}(-2)^j$

$= 3\cdot5^j + 2\cdot5^j - 3(-2)^j + 5\cdot(-2)^j$

$= 5\cdot5^j + 2\cdot(-2)^j$

$= 5^{j+1} + \frac{-2}{-1}(-2)^j$

$= 5^{j+1} - (-2)^{j+1}$

LHS = RHS

$\therefore$ Since the base case is true (P_0, P_1) $\boxed{1}$ and any P_2 of above is true $\boxed{3}$ we can say that $\forall n \in \mathbb{Z}, n > 0$

$$Y_n = 5^n - (-2)^n$$