<u>Class P</u> : P is a class of languages that are decidable in polynomial time on a deterministic single tape Turing machine. That is $P = \bigcup_{k} \text{TIME}\left(n^{k}\right)$.

Now, prove that P is closed under star operation. Consider a language $A \in P$. The following procedure decides A*:

$M = $ "*On input assume* $y = y_1 y_2 \ldots y_n \in \Sigma$.

　　1) if $y = \varepsilon$, output ACCEPT and halt.

　　2) Initialize the table $T[i, j] = 0$ for $i \le j$.

　　3) For $i = 1$ to n

　　　　a) Run M on y_i, *if* $y_i \in L$ then set $T[i, i] = 1$.

　　4) For $k = 2$ to n

　　　　For $i = 1$ to $n - k + 1$

　　　　a) Assume $j = i + k - 1$

　　　　b) Run M on $y_i \ldots y_j$, *if* $y_i \ldots y_j \in L$ then set $T[i, j] = 1$.

　　　　c) For $l = i$ to $j - 1$

　　　　　　Set $T[i, j] = 1$, *if* $T[i, l] = 1$ and $T[l, j] = 1$

　　5) Output ACCEPT if $T[1, n] = 1$; otherwise output REJECT.

The above algorithm is a polynomial time algorithm. Therefore, P is closed under star operation.