CSC 226 – SPRING 2019 – QUIZ 1

Name:
Student #: Solution

Question [2 marks]
Using the definition of big-Oh, show that if $p(n) = c_k n^k + c_{k-1} n^{k-1} + \cdots + c_2 n^2 + c_1 n + c_0$ is a polynomial in n, where $c_i \geq 0$ are real constants with $c_k > 0$ and $k \geq 1$ an integer, then $\log p(n)$ is $O(\log n)$.

Want to show that $\exists\, c > 0, n_0 > 0$, such that

$$\log p(n) \leq c \log n \quad \forall n \geq n_0$$

① We know that $p(n) \in O(n^k)$, thus $\exists\, d > 0$, $n_0 > 0$, such that

$$p(n) \leq dn^k \quad \forall n \geq n_0$$

let $n_0 \geq d$

② Provided that $dn^k > 1$

then $dn^k \leq n^{k+1}$ $\forall n \geq$

$$\log p(n) \leq \log(dn^k)$$
$$= \log d + k \log n$$
$$\leq (\log d + k) \log n$$

then

$\log p(n) \leq$

$\log$

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① Can show $c_k n^k + \cdots + c_1 n + c_0 \leq dn^k$ first

then do ②