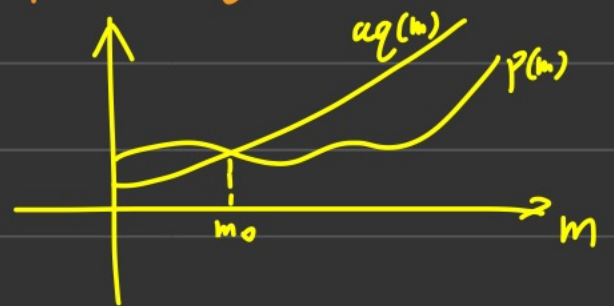


Big-oh, Big-omega, Big-theta

△ Big-oh [asymptotic upper bound]

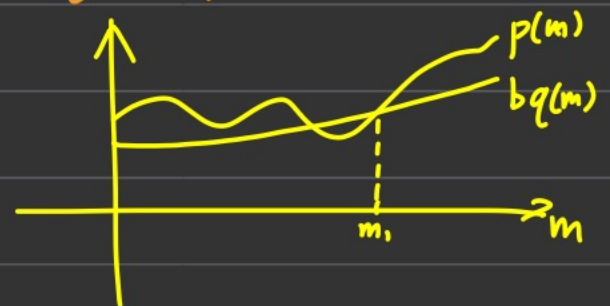
$$p(m) = O(q(m)) \text{ if } \exists a \text{ and } m_0 \Rightarrow 0 \leq p(m) \leq a q(m) \quad \forall m \geq m_0$$



Ex: $p(m) = 4 - 7m + 3m^2 + 9m^3$
then $q(m) = m^3$
 $\therefore p(m) = O(m^3)$ or $O(m^4) \dots$

△ Big-omega [asymptotic lower bound]

$$p(m) = \Omega(q(m)) \text{ if } \exists b \text{ and } m_1 \Rightarrow 0 \leq b q(m) \leq p(m) \quad \forall m \geq m_1$$



Ex: $p(m) = 4 - 7m + 3m^2 + 9m^3$
then $q(m) = m^3$
 $\therefore p(m) = O(m^3)$ or $O(m^2)$ or $O(m) \dots$

△ Big-theta [asymptotic tight bound]

$$p(m) = \Theta(q(m)) \text{ if } \exists a, b, \text{ and } m_2 \Rightarrow 0 \leq b q(m) \leq p(m) \leq a q(m) \quad \forall m \geq m_2$$

Ex: $p(m) = 4 - 7m + 3m^2 + 9m^3$
 $\therefore p(m) = \Theta(m^3)$