

1.  $7n - 2 = O(n)$

Rearranging equation

$$cn - 7n \geq 2$$

Taking n common

$$n(c - 7) \geq 2$$

Dividing with (c - 7) on both side

$$n \geq \frac{2}{(c-7)}$$

considering c = 8

$$n \geq 2$$

$$no = 2 \& c = 8$$

2.  $7n - 2 = \theta(n)$

$$7n - 2 \leq c2n$$

Rearranging equation

$$c2n - 7n \geq 2$$

Taking n common

$$n(c2 - 7) \geq 2$$

$$n \geq \frac{2}{(c2-7)}$$

considering c2 = 8

$$n \geq 2$$

$$no = 2 \& c2 = 8$$

Now

$$c1n \leq 7n - 2$$

$$c1(2) \leq 7(2) - 2$$

$$c1 \leq 6$$

$$c1n \leq 7n - 2 \leq c2n$$

$$6(2) \leq 7(2) - 2 \leq 8(2)$$

$$12 \leq 12 \leq 16$$

3.  $7n - 2 = \theta(x^2)$

$$cn^2 \leq 7n - 2 \leq c2n^2$$

Taking

$$7n - 2 \leq c2n^2$$

$$c2n^2 - 7n \geq c2n^2$$

$$n^2 \geq \frac{2}{c2-7}$$

considering c2 = 8

$$n \geq \sqrt{2}$$

$$no \geq \sqrt{2}$$

$$c1(\sqrt{2})^2 \leq 7(\sqrt{2}) - 2$$

$$c1 \leq \frac{7(\sqrt{2})-2}{2}$$

$$c1 \leq 3.94$$

$$3.94(\sqrt{2})^2 \leq 7\sqrt{2} - 2 \leq 8(\sqrt{2})^2$$

$$7.89 \leq 7.89 \leq 16$$

$$4. \quad 3n^3 + 20n^2 + 5 = O(n^6)$$

$$3n^3 + 20n^2 + 5 = cn^6$$

$$20n^2 + 5 = cn^6 - 3n^3$$

$$20n^2 + 5 = n^3(cn^3 - 3)$$

**Dividing by  $n^3$  on both sides**

$$\frac{20}{n} + \frac{5}{n^2} \leq cn^3 - 3$$

$$\frac{20}{n} + \frac{5}{n^2} + 3 \leq cn^3$$

$$\frac{\frac{20}{n} + \frac{5}{n^2} + 3}{n^3} \leq c$$

$$20n^2 + 5 + \frac{3}{n^3} \leq c$$

**Assuming  $n = 1$**

$$20(1)^2 + 5 + \frac{3}{(1)^3} \leq c$$

$$28 \leq c$$