5. prove $\frac{1}{2}n^2 - 3n = \Theta(n^2)$

Proof:

$$c_1 n^2 \le \frac{1}{2}n^2 - 3n \le c_2 n^2 = c_1 \le \frac{1}{2} - \frac{3}{n} \le c_2$$

$$n = 6 \quad c_1 \le 0 \le c_2$$

$$n \to \infty$$

$$n = 30 \Rightarrow c_1 \le \frac{2}{5} \le c_2, holds$$

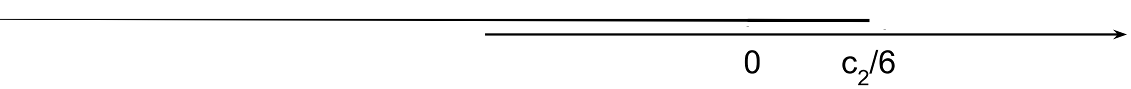
6. Show the Proof: $6n^3 \neq \Theta(n^2)$

#3: Contradictional Proof

$$Assume \quad that \quad c_1 n^2 \le 6n^3 \le c_2 n^2 = c_1 \le 6n \le c_2$$

$$n \le \frac{c_2}{6}$$

$$n \rightarrow \infty$$



$$it \quad doesn't \quad hold.$$

7. Show that: $5n^2 - 2n + 3 = \Theta(n^2)$

#4: Assumption Proof

$$\text{Assume that} \quad 2n^2 \le 5n^2 - 2n + 3 \le 10n^2$$

(1) $2n^2 \le 5n^2 - 2n + 3 \Rightarrow 3n^2 - 2n + 3 \ge 0$

discriminant:

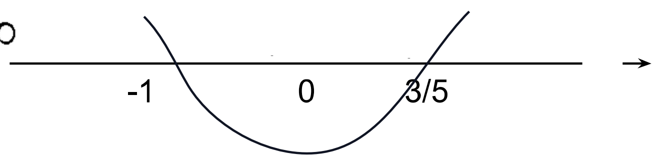
$(-2)^2 - 4 \times 3 \times 3 < 0 \Rightarrow$ *no intercepts on* $x-axis$

$\Rightarrow$ *for all* n, *it holds.*

(2) $5n^2 - 2n + 3 \le 10n^2 \Rightarrow 5n^2 + 2n - 3 \ge 0$

$\Rightarrow (5n-3)(n+1) \ge 0 \Rightarrow$ n>=⅗ or n<=-1

$n \to \infty$



it holds.

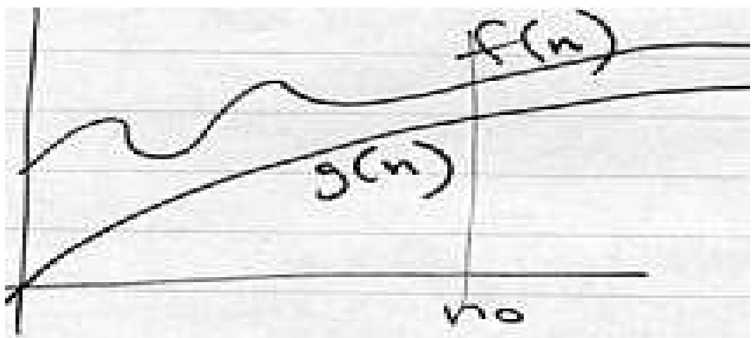
8. Show that

$$Omega\ \Omega - lower\ bound$$

$$f(n) = \Omega(g(n))$$

$$proof:\quad 0 \le cg(n) \le f(n)$$

$$c? \qquad n_o < n \qquad c > 0$$



$$n^{\frac{1}{2}} = \Omega(\lg n)$$

$$c \lg_2 n \le \sqrt{n} \qquad c = 1$$

$$c \lg_2 16 \le \sqrt{16} \qquad n > 16$$

$$(1) 4 \le 4 \qquad n_o$$

$$\lg_2 64 \le \sqrt{64}$$

$$(2) 6 \le 8$$

Meditate it with another approach!