Yuchen Jin
CUS1188
Problem Set 3

1

$$T(n) = \sum_{i=1}^{log_2 n + 1} 2i + 2 = (log_2 n)^2 + 5log_2 n + 6$$

2

a) 57
b) $T(n) = 2n + 4$
c)

$$T(n) = 2n + 4 \in O(n)$$
$$2n + 4 \leq cn$$
$$\frac{2n+4}{n} \leq c$$
$$\lim_{n\to\infty} \frac{2n+4}{n} \leq c$$
$$2 \leq c$$
$$T(n) \in O(n)$$

3

$$f(n) = n^2 + 3n^3 \in \Theta(n^3)$$

$$n^2 + 3n^3 \in O(n^3)$$
$$n^2 + 3n^3 \leq cn^3$$
$$\frac{n^2+3n^3}{n^3} \leq c$$
$$\lim_{n\to\infty} \frac{n^2+3n^3}{n^3} \leq c$$
$$3 \leq c$$

$$n^2 + 3n^3 \in \Omega(n^3)$$
$$n^2 + 3n^3 \geq cn^3$$
$$\frac{n^2+3n^3}{n^3} \geq c$$
$$\lim_{n\to\infty} \frac{n^2+3n^3}{n^3} \geq c$$
$$3 \geq c$$