2. The sequence u_1, u_2, u_3, ... is defined by

$$u_1 = k$$
$$u_{n+1} = 3u_n - 2$$

where k is a constant.

(a) Find, in simplest form in terms of k,

(i) u_2

(ii) u_3

(2)

Given that $\sum_{r=1}^{4} u_r = 44$

(b) find the value of k.

(3)

(a)(i) $u_1 = k$

$u_2 = 3(u_1) - 2 = 3k - 2$ (1 mark)

(a)(ii) $u_3 = 3(u_2) - 2 = 3(3k-2) - 2$
$$= 9k - 6 - 2$$
$$= 9k - 8 \qquad \text{(1 mark)}$$

(b) $u_4 = 3(u_3) - 2 = 3(9k-8) - 2$
$$= 27k - 24 - 2$$
$$= 27k - 26 \qquad \text{(1 mark)}$$

$\sum_{r=1}^{4} u_r = u_1 + u_2 + u_3 + u_4 = 44$

$\Rightarrow \quad k + (3k-2) + (9k-8) + (27k-26) = 44$ (1 mark)

$$40k - 36 = 44$$

$\Rightarrow \quad k = 2$ (1 mark)