5.

Use the iteration technique to find a Big-Oh bound for the recurrence relation below.

Note you may find the following mathematical result helpful: $2^{\log_3 n} = n^{\log_3 2}$ ,

$\sum_{i=0}^{\infty} (2/3)^i = 3$

$T(n) = 2T(n/3) + cn$     $T(1) = 1$

$T(\frac{n}{3}) = 2T(\frac{n/3}{3}) + c(\frac{n}{3})$

$T(\frac{n}{9}) = 2T(\frac{n/9}{3}) + c(\frac{n}{9})$

$T(\frac{n}{27}) = 2T(\frac{n/27}{3}) + c(\frac{n}{27})$

$T(n) = 2T(\frac{n}{3}) + cn, T(1) = 1$

$T(n) = 2(2T(\frac{n}{9}) + c(\frac{n}{3})) + cn$

$T(n) = 4T(\frac{n}{9}) + c(\frac{2n}{3}) + cn$

$T(n) = 4(2T(\frac{n}{27}) + c(\frac{n}{9})) + c(\frac{2n}{3}) + cn$

$T(n) = 8T(\frac{n}{27}) + c(\frac{4n}{9}) + c(\frac{2n}{3}) + cn$

$T(n) = 2^k T(\frac{n}{3^k}) + cn(\sum_{i=0}^{k-1} (\frac{2}{3})^i)$

$k = \log_3 n$

$T(n) = 2^{\log_3 n} + 3cn$

$\boxed{O(n)}$