(a) Prove by induction that $8^{n}-1$ is divisible by 7 for all $n \in \mathbb{N}$.

(b) Given $\log _{a} 2=p$ and $\log _{a} 3=q$, where $a>0$, write each of the following in terms of $p$ and $q$ :
(i) $\log _{a} \frac{8}{3}$

(ii) $\log _{a} \frac{9 a^{2}}{16}$.


| Previous | Page | Running |
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