$T(n) = 8T(n/2) + \frac{n^2}{2}$ $\quad T(1) = 4$

$i=1$ $\quad T(n/2) = 8T(n/4) + \frac{1}{2}\left(\frac{n}{2}\right)^2$

$i=2$ $\quad T(n) = 8^2 T(n/2^2) + \frac{8}{2}\left(\frac{n}{2}\right)^2$

$T(n/2^2) = 8T(n/2^3) + \frac{1}{2}\left(\frac{n}{2^2}\right)^2$

$i=3$ $\quad T(n) = 8^3 T(n/2^3) + \frac{8^2}{2}\left(\frac{n}{2^2}\right)^2 + \frac{8}{2}\left(\frac{n}{2}\right)^2$

$T(n) = 8^i T\left(\frac{n}{2^i}\right) + \frac{8^{i-1}}{2}\left(\frac{n}{2^{i-1}}\right)^2 + \frac{8^{i-2}}{2}\left(\frac{n}{2^{i-2}}\right)^2 \dots$

$\frac{n}{2^i} = 1 \qquad i = \log_2(n)$

$$T(n) = \sum_{p=0}^{i} \frac{8^p}{2}\left(\frac{n}{2^p}\right)^2 = \sum_{p=0}^{\log(n)} \frac{8^p}{2}\left(\frac{n}{2^p}\right)^2$$

$$T(n) = \sum_{p=0}^{\log(n)} \frac{8^p}{2}\frac{n}{2^p}\frac{n}{2^p} = \frac{n^2}{2}\sum_{p=0}^{\log(n)} \frac{8^p}{2^{2p}} = \frac{n^2}{2}\sum_{p=0}^{\log(n)} \frac{8^p}{4^p} = \frac{n^2}{2}\sum_{p=0}^{\log(n)} \left(\frac{8}{4}\right)^p$$

$$T(n) = \frac{n^2}{2}\sum_{p=0}^{\log(n)} 2^p \quad \frac{n^2}{2}\frac{2^{\log(n)+1}-1}{2-1} \quad \frac{n^2}{2}\frac{2^{\log(n)}\times 2 - 1}{2-1} = \left(\frac{n^2}{2}\right)\frac{2n-1}{1} = n^3 - n^2$$

$$O(n^3)$$

$a = 8 \qquad b = 2 \qquad F(n) = \frac{n^2}{2}$

$\log_b a = \log_2 b = 3$

1) $\frac{n^2}{2}$ es $O(n^{3-\epsilon})$ ✓

$\epsilon = 1$

$O(n^{\log_b a}) = O(n^3)$