Extra Credit 3.3

(a) $T(n) = 2T(n/2) + n^3$

homogeneous $T(n) = 2T(n/2)$

$T_P(n) = Cn$

$T_P(n) = Cn^3$

$Cn^2 = \frac{C}{4}n^3 + n^3$

$T(n) = T_G(n) + T_P(n)$

$T(1) = 1$ Therefore $C = -1/3$

$T(n) = 4/3(4n - 1)$

b) $T(n) = 2T(n/4) + \sqrt{n}$

$2(2T(n/16) + \sqrt{n/4}) + \sqrt{n} = 4T(n/16) + 2\sqrt{n}$

$2(4T(n/64) + 2\sqrt{n/16}) + \sqrt{n} = 8T(n/64) + 2\sqrt{n}$

$2(8T(n/256) + 2\sqrt{n/64}) + \sqrt{n} = 16T(n/256) + 5/4\sqrt{n}$

c) $T(n) = T(\sqrt{n}) + 1$ Consider $n = 2^{2k}$

$T(2^{2k}) = T(\sqrt{2^{2k}}) + 1 \Rightarrow T(2^{2k-1}) + 1$

$T(2^{2^0}) + k = T(2) + K$

$T(2) = T(\sqrt{2}) + 1 \rightarrow T(k) = T(\sqrt{k}) + 1$

d) $T(n) = 4T(n/2) + n^2$

$T(n) = n^2 + 4(4T(n/4) + n^2/4)$

$= 2n^2 + 16T(n/4)$

$k \cdot n^2 + 4^k T(n/2^k)$