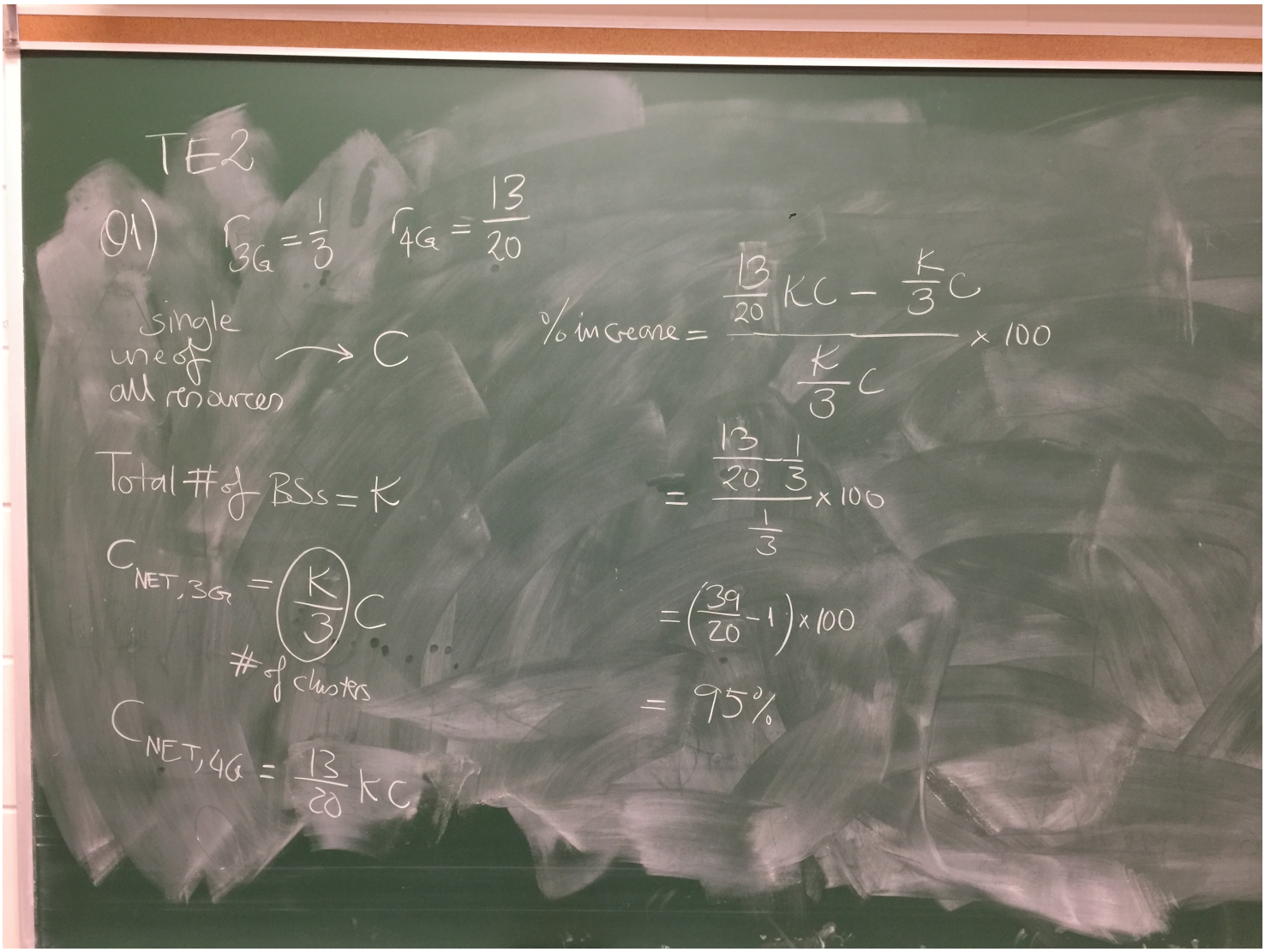
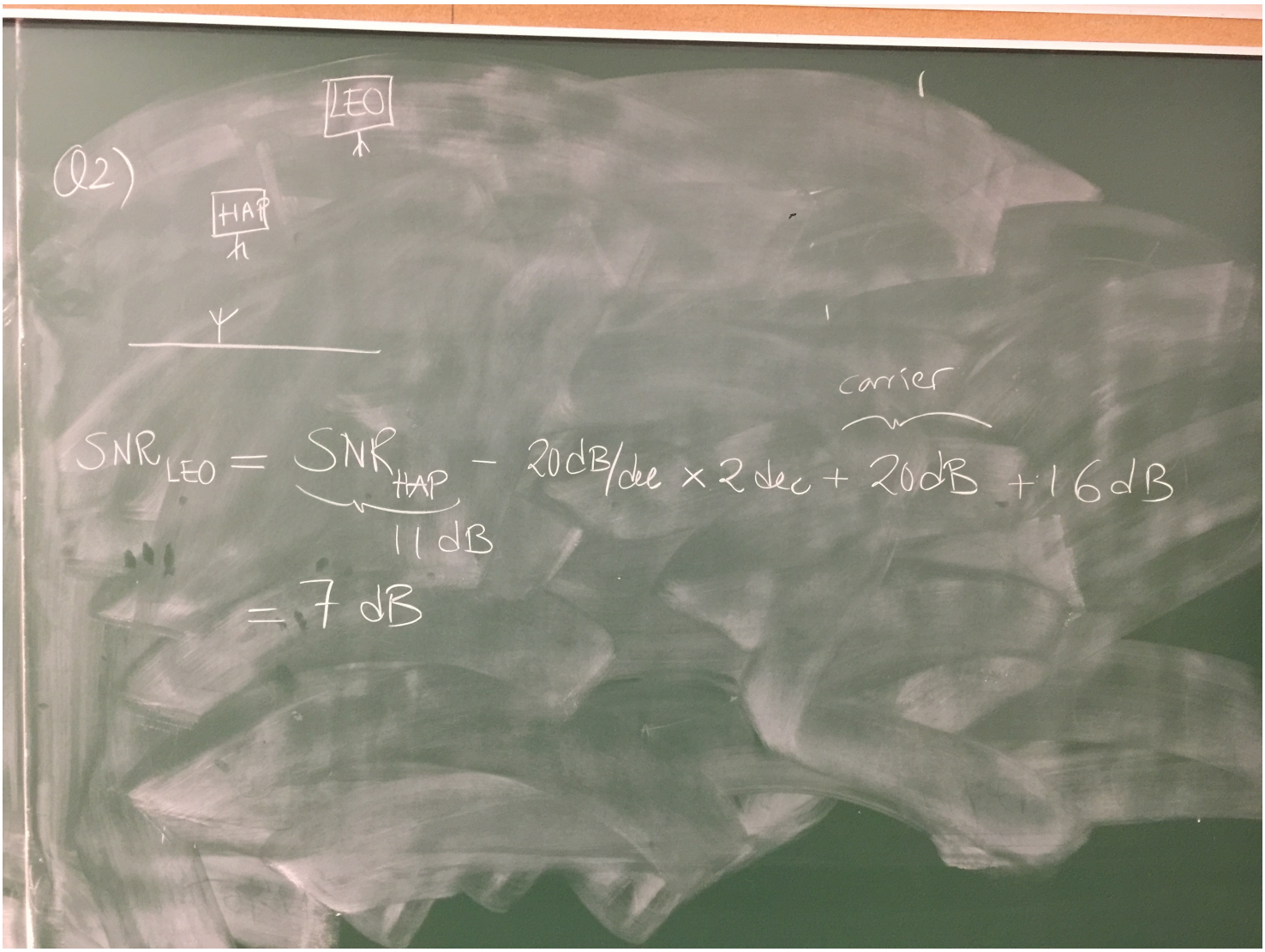

TE2
01) $r_{3G} = \frac{1}{3}$ $r_{4G} = \frac{13}{20}$
single use of all resources → C
Total # of BSs = K
$C_{NET,3G} = \left(\frac{K}{3}\right)C$
# of clusters
$C_{NET,4G} = \frac{13}{20}KC$
% increase $= \frac{\frac{13}{20}KC - \frac{K}{3}C}{\frac{K}{3}C} \times 100$
$= \frac{\frac{13}{20} - \frac{1}{3}}{\frac{1}{3}} \times 100$
$= \left(\frac{39}{20} - 1\right) \times 100$
$= 95\%$

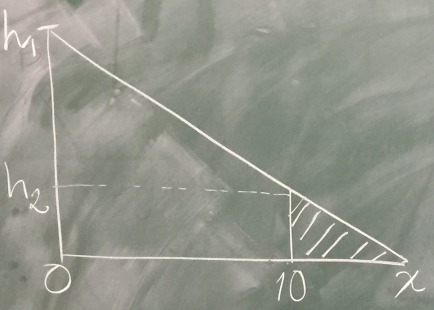


$$SNR_{LEO} = \underbrace{SNR_{HAP}}_{11\,dB} - 20\,dB/dec \times 2\,dec + \overbrace{20\,dB}^{carrier} + 16\,dB$$

$$= 7\,dB$$

TE2

Q3)



$$\frac{(x-10)h_2}{2} = 0.1\,\frac{h_1 x}{2} \qquad \frac{h_1}{h_2} = \frac{x}{x-10}$$

$$10\,\frac{(x-10)h_1(x-10)}{x} = h_1 x$$

$$10(x-10)^2 = x^2$$

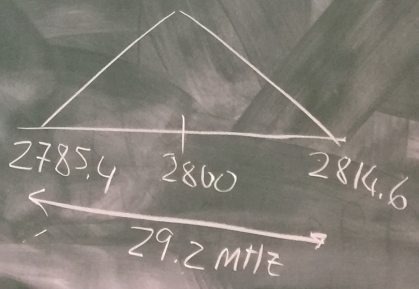
$$10(x^2-20x+100) = x^2$$

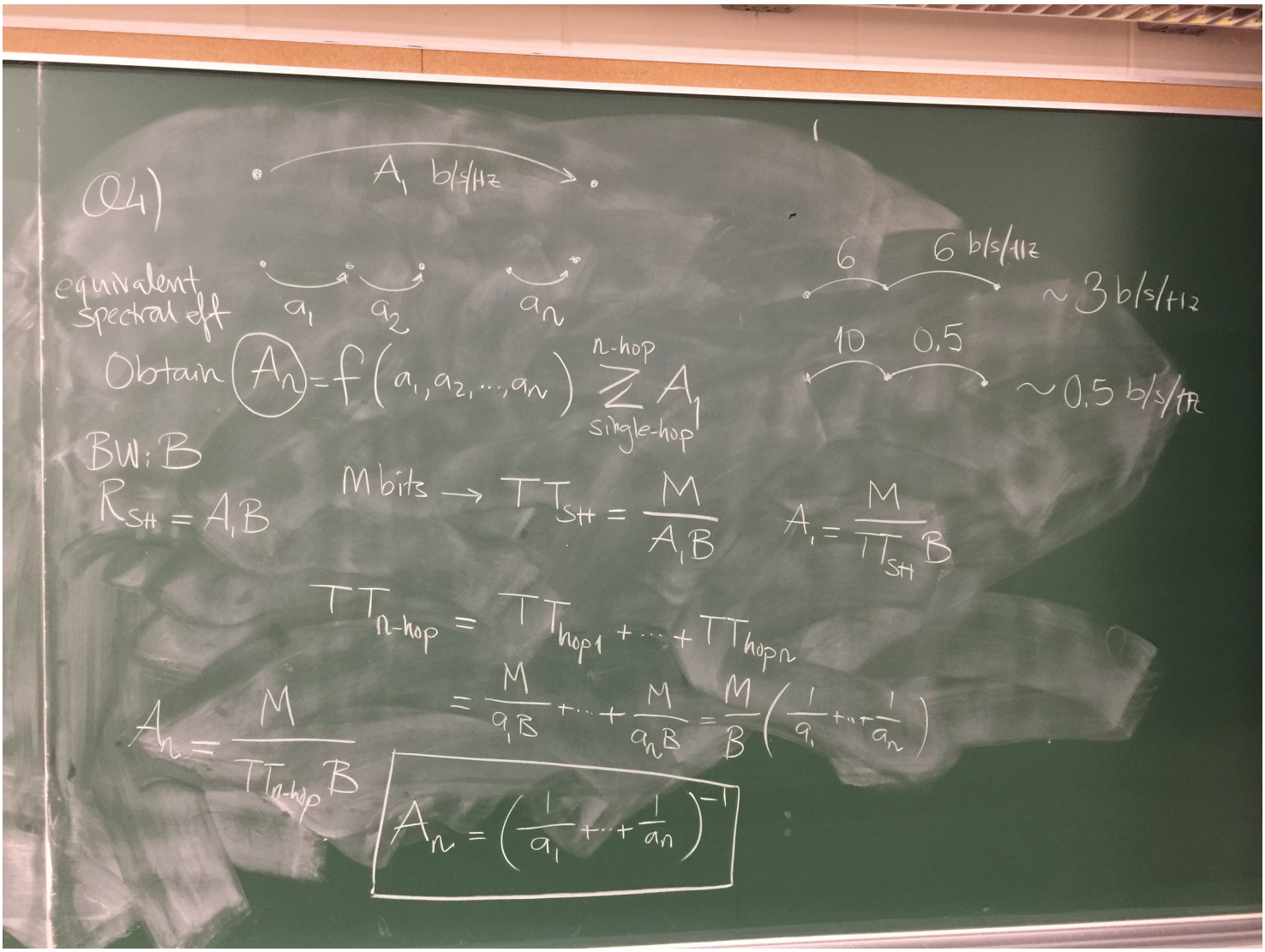
$$9x^2-200x+1000 = 0 \quad , \quad x>10$$

$$x = \frac{200 \pm \sqrt{200^2-4\cdot 9\cdot 1000}}{18}$$

$$x = \frac{200 \pm 63.2}{18} \rightarrow \cancel{7.6} \quad \rightarrow 14.6$$

$x = 14.6$




(Q4)
A_1 b/s/Hz
equivalent spectral eff
a_1 a_2 a_n
Obtain $A_n = f(a_1, a_2, \cdots, a_n) \geq \sum_{\text{single-hop}}^{n\text{-hop}} A_1$
BW: B
$R_{SH} = A_1 B$
M bits $\rightarrow TT_{SH} = \frac{M}{A_1 B}$
$A_1 = \frac{M}{TT_{SH} B}$
$TT_{n\text{-hop}} = TT_{hop1} + \cdots + TT_{hopn}$
$= \frac{M}{a_1 B} + \cdots + \frac{M}{a_n B} = \frac{M}{B}\left(\frac{1}{a_1} + \cdots + \frac{1}{a_n}\right)$
$A_n = \frac{M}{TT_{n\text{-hop}} B}$
$A_n = \left(\frac{1}{a_1} + \cdots + \frac{1}{a_n}\right)^{-1}$
6 6 b/s/Hz
~3 b/s/Hz
10 0.5
~0.5 b/s/Hz