Ex 2:

1. $P(million \mid spam) = \frac{156}{95791}$
   $P(dollars \mid spam) = \frac{29}{95791}$
   $P(adclick \mid spam) = \frac{51}{95791}$
   $P(conferences \mid spam) = \frac{0}{95791} \approx 0.000001$

   $P(million \mid ham) = \frac{98}{95791}$
   $P(dollars \mid ham) = \frac{119}{95791}$
   $P(adclick \mid ham) = \frac{0}{95791} \approx 0.000001$
   $P(conferences \mid ham) = \frac{12}{95791}$

2. $P(Word \neq million) = 1 - P(Word = million) = 1 - (0.5 * P(million \mid spam) + 0.5 * P(million \mid ham)) = 1 - (0.5 * \frac{156}{95791} + 0.5 * \frac{98}{95791}) = 1 - \frac{127}{95791} = \frac{95664}{95791} \approx 0.9987$

3. $P(spam \mid million) = \frac{P(million \mid spam)P(spam)}{P(million)} = \frac{\frac{156}{95791} * \frac{1}{2}}{1 - \frac{95664}{95791}} = \frac{78}{127} \approx 0.6142$

4. $P(spam \mid million, dollars, adclick, conferences) = \frac{P(million,dollars,adclick,conferences \mid spam)P(spam)}{P(million,dollars,adclick,conferences)} = \frac{P(million \mid spam)P(dollars \mid spam)P(adclick \mid spam)P(conferences \mid spam)P(spam)}{P(million)P(dollars)P(adclick)P(conferences)} = \frac{P(million \mid spam)P(dollars \mid spam)P(adclick \mid spam)P(conferences \mid spam)P(spam)}{(P(million \mid spam)+P(million \mid ham)+P(dollars \mid spam)+P(dollars \mid ham)+P(adclick \mid spam)+P(adclick \mid ham)+P(confere}$

   $= \frac{\frac{156}{95791} * \frac{29}{95791} * \frac{51}{95791} * 0.000001 * \frac{1}{2}}{\frac{1}{2}(\frac{156}{95791} + \frac{29}{95791} + \frac{51}{95791} + 0.000001 + \frac{98}{95791} + \frac{119}{95791} + 0.000001 + \frac{12}{95791})}$
   $\approx 5.4 * 10^{-14}$

   It does not appear to be spam, but it's also clearly an odd case with both the word conferences and adclick.

$spamicity = \frac{P(spam \mid million, dollars, adclick, conferences)}{P(ham \mid million, dollars, adclick, conferences)}$
$= \frac{P(spam)}{P(ham)} \frac{P(million \mid spam)}{P(million \mid ham)} \frac{P(dollars \mid spam)}{P(dollars \mid ham)} \frac{P(adclick \mid spam)}{P(adclick \mid ham)} \frac{P(conferences \mid spam)}{P(conferences \mid ham)}$
$= \frac{\frac{1}{2}}{\frac{1}{2}} \frac{\frac{156}{95791}}{\frac{98}{95791}} \frac{\frac{29}{95791}}{\frac{119}{95791}} \frac{\frac{51}{95791}}{0.000001} \frac{0.000001}{\frac{12}{95791}} \approx 1.6$