P1.

1	1	1	0	1
0	1	1	0	0
1	0	0	1	0
1	1	0	1	1
1	1	0	0	0

P5.

Divide 10011 into 1010101010 0000, then get 1011011100, with remainder of 0100, and R = 0100

P6.

a. R = 0000

b. R = 1111

c. R = 1001

P8.

a) $E(p) = Np(1-p)^{N-1}$

$E'(p) = N(1-p)^{N-1} - Np(N-1)(1-p)^{N-2}$

$= N(1-p)^{N-2}((1-p) - p(N-1))$

$E'(p) = 0 \Rightarrow p^* = \frac{1}{N}$

b) $E(p^*) = N \cdot \frac{1}{N}(1-\frac{1}{N})^{N-1} = (1-\frac{1}{N})^{N-1} = \frac{(1-\frac{1}{N})^N}{1-\frac{1}{N}}$

$\lim_{N\to\infty}(1-\frac{1}{N}) = 1 \qquad \lim_{N\to\infty}(1-\frac{1}{N})^N = \frac{1}{e}$

$\lim_{N\to\infty} E(p^*) = \frac{1}{e}$

P9.

$E(p) = Np(1-p)^{2(N-1)}$

$$E'(p) = N(1-p)^{2(N-1)} - Np\,2(N-1)(1-p)^{2(N-3)}$$

$$= N(1-p)^{2(N-3)}\left((1-p) - p\,2(N-1)\right)$$

$$E'(p) = 0 \Rightarrow p^* = \frac{1}{2N-1}$$

$$E(p^*) = \frac{N}{2N-1}\left(1-\frac{1}{2N-1}\right)^{2(N-1)}$$

$$\lim_{N\to\infty} E(p^*) = \frac{1}{2}\cdot\frac{1}{e} = \frac{1}{2e}$$