CPMA 521, Fall 2001
Professor Larget
Assignment #3: due September 24, 2001

1. Do problem 2.2. You do not need to write out the entire probability transition matrix. It is sufficient to specify p_{ij} for $1 \leq i, j \leq N$. For example, you may say something like this.

$$p_{0j} = \begin{cases} 1 & \text{if } j = 1 \\ 0 & \text{otherwise} \end{cases}$$

$$p_{ij} = \begin{cases} 0.5 & \text{if } i \geq 1 \text{ and } |i - j| = 1 \\ 0 & \text{otherwise} \end{cases}$$

2. Do problem 2.5.

3. Do problem 2.19.

4. Enter the matrix from the class example. Here is one way to do it.

```
r1 <- c(4/5,1/5,0,0)
r2 <- c(0,0,1/2,1/2)
r3 <- c(1/2,1/2,0,0)
r4 <- c(0,0,1/5,4/5)
P <- rbind(r1,r2,r3,r4)
```

Now, repeatedly square this matrix until it does not appear to change. For example,

```
P2 <- P %*% P
P4 <- P2 %*% P2
P8 <- P4 %*% P4
```

Guess the rational numbers that make up the limit of this matrix $P(n)$ as $n \to \infty$.

5. For the same matrix above, calculate the first several state distributions beginning with $\boldsymbol{\pi}^{(0)} = (1, 0, 0, 0)$. For example,

```
p0 <- c(1,0,0,0)
p <- p0
for(i in 1:20) {
    p <- p %*% P
    print(p)
}
```

What do you guess is the limiting value of $\boldsymbol{\pi}^{(n)}$? How is related to what you discovered in the previous problem? Explain the connections between your answers.