

ex7.6

```
library(expm)
```

```
## Loading required package: Matrix
```

```
##
```

```
## Attaching package: 'expm'
```

```
## The following object is masked from 'package:Matrix':
```

```
##
```

```
##      expm
```

```
Q <- matrix(c(-2,1,1,0,1,-3,1,1,2,2,-4,0,1,2,3,-6), nrow = 4, byrow = T)
colnames(Q) <- 1:4
rownames(Q) <- 1:4
Q
```

```
##      1  2  3  4
## 1 -2  1  1  0
## 2  1 -3  1  1
## 3  2  2 -4  0
## 4  1  2  3 -6
```

```
P <- function(t) expm(t*Q)
P(100)
```

```
##      1      2      3      4
## 1 0.4070796 0.3185841 0.2212389 0.05309735
## 2 0.4070796 0.3185841 0.2212389 0.05309735
## 3 0.4070796 0.3185841 0.2212389 0.05309735
## 4 0.4070796 0.3185841 0.2212389 0.05309735
```

```
# part(a)
print("Answer to part(a) is ")
```

```
## [1] "Answer to part(a) is "
```

```
P(100)[1,1]
```

```
## [1] 0.4070796
```

```
# part(b)
print("Answer to part(b) is ")
```

```
## [1] "Answer to part(b) is "
```

```
P(100)[2,3]
```

```
## [1] 0.2212389
```

```
# part(c)
print("Answer to part(c) is ")
```

```
## [1] "Answer to part(c) is "
```

```
mat <- P(1)
mat[1,3]
```

```
## [1] 0.2159691
```

```
# part(d)
print("Answer to part(d) is ")
```

```
## [1] "Answer to part(d) is "
```

```
P(3)[4,1] * P(1)[3,4]
```

```
## [1] 0.0214681
```