

# HW5

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```
library(igraph)

## Warning: package 'igraph' was built under R version 4.0.5
##
## Attaching package: 'igraph'
##
## The following objects are masked from 'package:stats':
##
##     decompose, spectrum
##
## The following object is masked from 'package:base':
##
##     union
```

## Question 1

```
g1 <- graph.formula(1-3,1-4,1-5,1-6,2-4,2-5,2-6,3-5,4-6)
igraph.options(vertex.color="dodgerblue",vertex.size=25,
               vertex.label.cex=1.25,vertex.label.color="white",
               edge.color="red",edge.arrow.size=1,edge.width=2)
tkplot(g1)

## [1] 1
# Find the number of edges and the number of vertices
vcount(g1)

## [1] 6
ecount(g1)

## [1] 9
# Find the degrees
degree(g1)

## 1 3 4 5 6 2
## 4 2 3 3 3 3
# Find the degree distribution for the network g1
degree.distribution(g1)

## [1] 0.0000000 0.0000000 0.1666667 0.6666667 0.1666667
# Find the average nearest neighbour degree for vertices 2, 3, and 4
knn(g1)$knn
```

```

##           1           3           4           5           6           2
## 2.750000 3.500000 3.333333 3.000000 3.333333 3.000000
# Find the diameter of the network
diameter(g1)

## [1] 2
# Find which pairs of nodes has largest shortest path distance between them
shortest.paths(g1)

##    1 3 4 5 6 2
## 1 0 1 1 1 1 2
## 3 1 0 2 1 2 2
## 4 1 2 0 2 1 1
## 5 1 1 2 0 2 1
## 6 1 2 1 2 0 1
## 2 2 2 1 1 1 0

newg1 <- graph.formula(1-3,1-5,1-6,2-4,2-5,2-6,3-5,4-6)
igraph.options(vertex.color="dodgerblue",vertex.size=25,
               vertex.label.cex=1.25,vertex.label.color="white",
               edge.color="red",edge.arrow.size=1,edge.width=2)
diameter(newg1)

## [1] 3
# Find the closeness centralities of the nodes
closeness(g1)

##           1           3           4           5           6           2
## 0.1666667 0.1250000 0.1428571 0.1428571 0.1428571 0.1428571

```