**Question 1**

The C program *paretodnes.c* is attached in the Appendix. We use the following code to compile it.

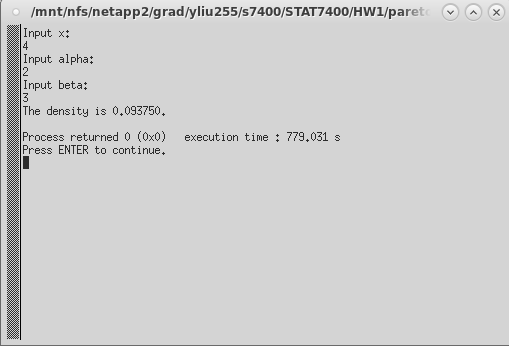
gcc paretodens.c -o paretodens -lm -Wall -pedantic

In this way we have generated an executable file called *paretodens.* Run this program, the following window will pop up. Users will enter the values of x, alpha and beta for pareto distribution one by one.

****

Three sets of values are used to test it.

1. x = 4, alpha = 2, beta = 3



1. x = 4, alpha = 5, beta = 3



1. x = 4, alpha = 2, beta = -3

****

**Question 2**

The R program *dpareto.r* is as follows.

dpareto <- function(x,alpha,beta){

#Calculate the maximum length of inputs

L <- max(length(x), length(alpha), length(beta))

#Align all the inputs

x <- rep(x,length.out = L)

alpha <- rep(alpha,length.out = L)

beta <- rep(beta,length.out = L)

#Initialize the densities with NaN

dens <- rep(NaN, length.out = L)

for (i in 1:L){

if (alpha[i] <= 0 || beta[i] <= 0){

warning("NaNs produced")

next

} else if (x[i] < alpha[i]){

dens[i] <- 0

} else{

dens[i] <- beta[i]\*alpha[i]^beta[i]/x[i]^(beta[i]+1)

}

}

return(dens)

}

I use the following set of values to test it.

* x = c(4,4,4)
* alpha = c(2,5,2)
* beta = c(3,3,-3)

The results are as follows.

> dpareto(c(4,4,4),c(2,5,2),c(3,3,-3))

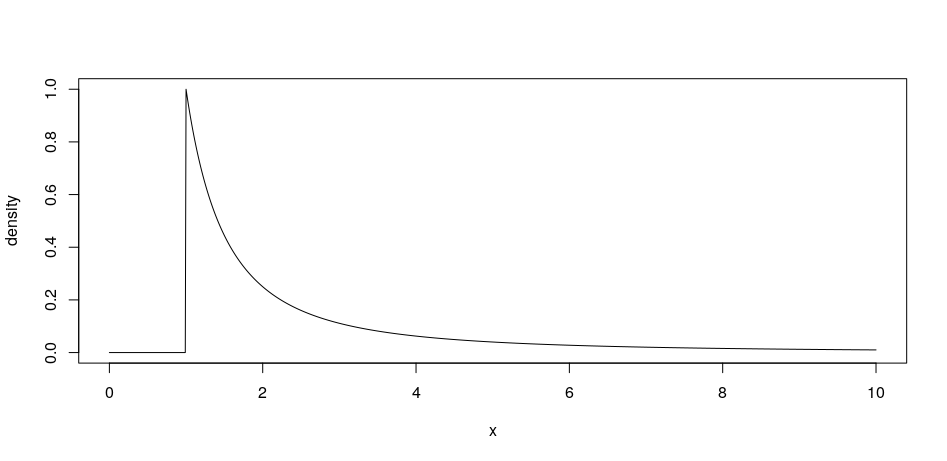
[1] 0.09375 0.00000 NaN

Warning message:

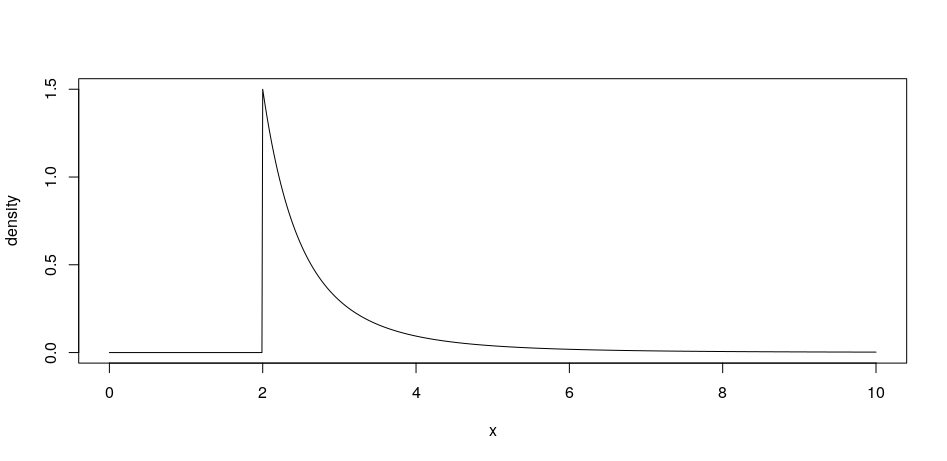
In dpareto(c(4, 4, 4), c(2, 5, 2), c(3, 3, -3)) : NaNs produced

Then I use this function to plot the density in R. Two sets of parameters are used.

1. alpha = 1, beta = 1



1. alpha = 2, beta = 3



**Appendix**

paretodens.c

#include <stdio.h>

#include <math.h>

/\*Define parto density function\*/

double paretodens(double x, double alpha, double beta) {

/\*Check whether alpha and beta are positve\*/

if (alpha <=0 || beta <= 0){

printf("Warning message: The parameters are not meaningful! NaN produced!\n");

return NAN;

}

/\*Check whether x is greater than alpha\*/

else if (x < alpha){

return 0;

}

else {

return beta\*pow(alpha,beta)/pow(x,beta+1);

}

}

int main() {

double x,alpha,beta;

printf("Input x:\n");

scanf("%lf",&x);

printf("Input alpha:\n");

scanf("%lf",&alpha);

printf("Input beta:\n");

scanf("%lf",&beta);

printf("The density is %lf.\n", paretodens(x,alpha,beta));

return 0;

}