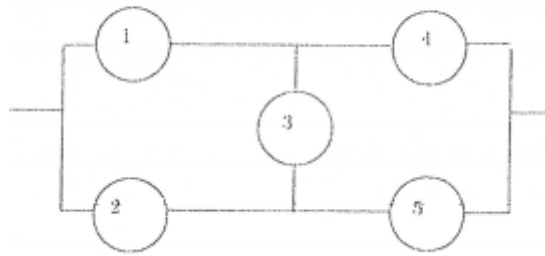# fiabilité

camille

21/11/2020
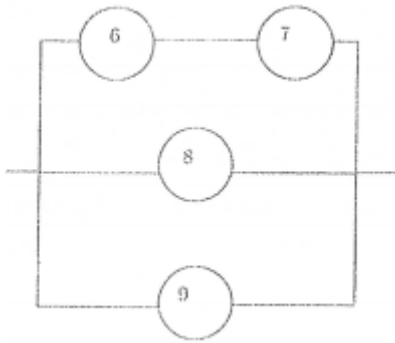
```r
phi_1 <- function(x){
  rep <- ((x[3]*(1-(1-x[1])*(1-x[2])))*(1-(1-x[4])*(1-x[5])))+(1-x[3])*(1-(1-x[1]*x[4])*
          (1-x[2]*x[5])))
  return(rep)
}
```

```r
phi_1(c(0,0,1,1,1))
```

```
## [1] 0
```

```r
phi_1(c(1,0,0,1,0))
```
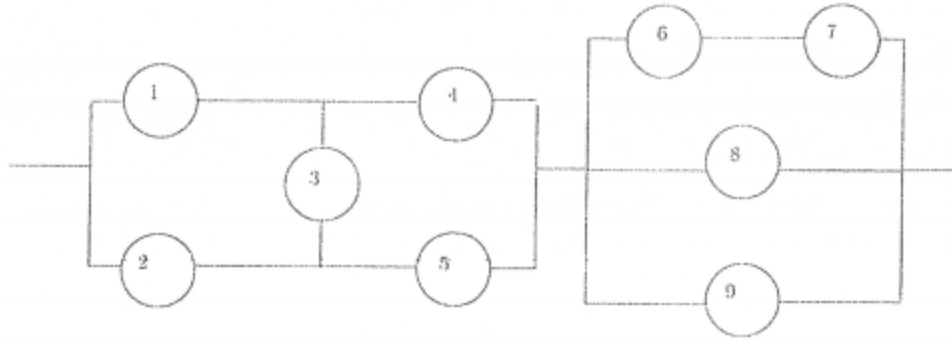
```
## [1] 1
```



```r
phi_2 <- function(x){
  rep <- (1-(1-x[1]*x[2])*(1-x[3])*(1-x[4]))
  return(rep)
}
```

```r
phi_2(c(1,0,0,0))
```

```
## [1] 0
```

```r
phi_2(c(0,0,1,0))
```

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

```r
phi <- function(x){
  rep <- ((x[3]*(1-(1-x[1])*(1-x[2]))*(1-(1-x[4])*(1-x[5])))+(1-x[3])*
          (1-(1-x[1]*x[4])*(1-x[2]*x[5])))*(1-(1-x[6]*x[7])*(1-x[8])*(1-x[9]))
  return(rep)
}
```

```r
phi(c(1,0,0,0,1,1,1,1,1))
```

```
## [1] 0
```

```r
phi(c(1,1,0,0,1,1,1,1,1))
```

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

```r
survie_sys <- function(loi, lambda, beta, t){
  R1 <- 1-loi(t, shape = beta, scale = lambda)
  R2 <- 1-loi(t, shape = beta, scale = lambda)
  R3 <- 1-loi(t, shape = beta, scale = lambda)
  R4 <- 1-loi(t, shape = beta, scale = lambda)
  R5 <- 1-loi(t, shape = beta, scale = lambda)
  R6 <- 1-loi(t, shape = beta, scale = lambda)
  R7 <- 1-loi(t, shape = beta, scale = lambda)
  R8 <- 1-loi(t, shape = beta, scale = lambda)
  R9 <- 1-loi(t, shape = beta, scale = lambda)
  rep <- ((R3[t]*(1-(1-R1[t])*(1-R2[t]))*(1-(1-R4[t])*(1-R5[t])))+(1-R3[t])*
          (1-(1-R1[t]*R4[t])*(1-R2[t]*R5[t])))*(1-(1-R6[t]*R7[t])*
              (1-R8[t])*(1-R9[t]))
  return(rep)
}
```

```r
g <- ggplot() +
  geom_line(aes(x = 1:35, y = survie_sys(pweibull, 20, 2, 0:35))) +
  labs(title = "survie du système",
       x = "temps",
       y = "proba de survie")

g
```

survie du système
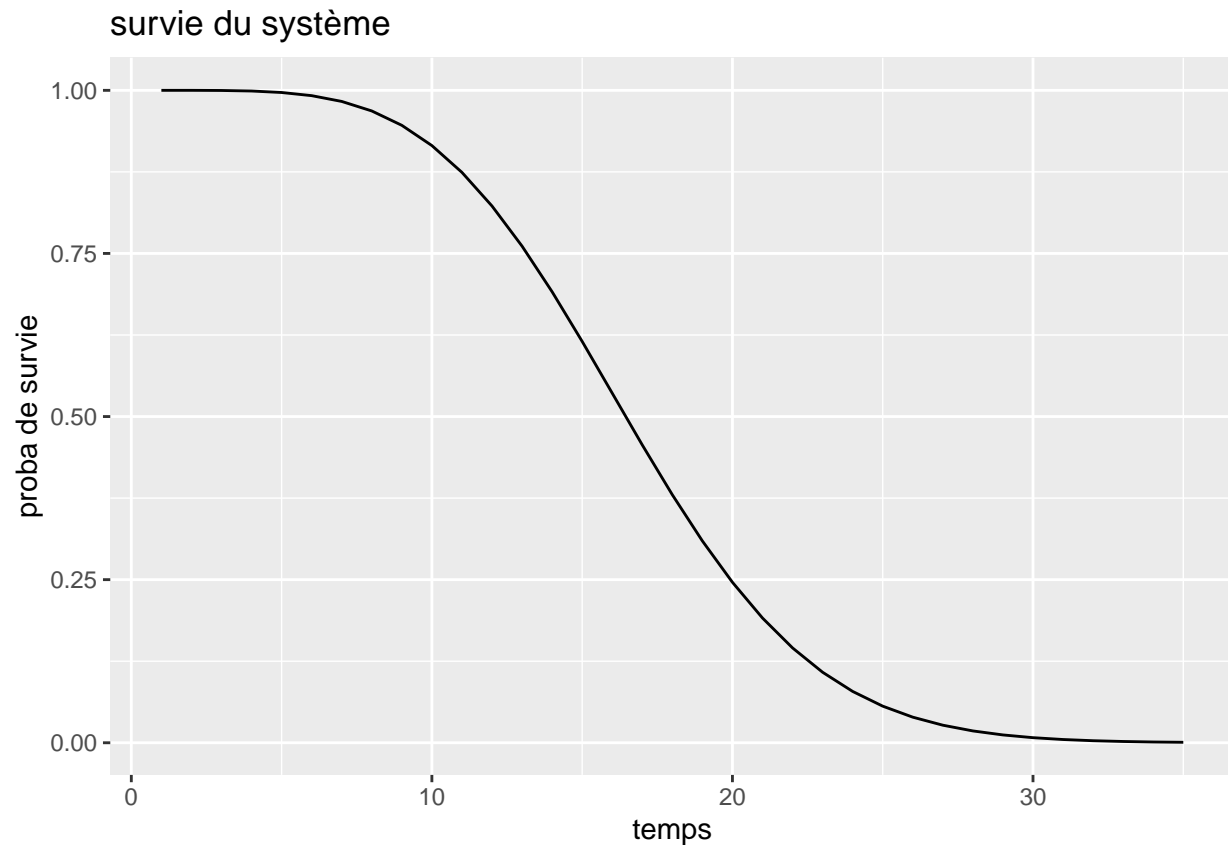

```r
ln_surv <- function(lambda, beta, t){
  rep=NULL
  for(i in 1:length(t)){
    R1 <- 1-pweibull(t[i], shape = beta, scale = lambda)
    R2 <- 1-pweibull(t[i], shape = beta, scale = lambda)
    R3 <- 1-pweibull(t[i], shape = beta, scale = lambda)
    R4 <- 1-pweibull(t[i], shape = beta, scale = lambda)
    R5 <- 1-pweibull(t[i], shape = beta, scale = lambda)
    R6 <- 1-pweibull(t[i], shape = beta, scale = lambda)
    R7 <- 1-pweibull(t[i], shape = beta, scale = lambda)
    R8 <- 1-pweibull(t[i], shape = beta, scale = lambda)
    R9 <- 1-pweibull(t[i], shape = beta, scale = lambda)
    rep[i] <- -log(((R3*(1-(1-R1)*(1-R2))*(1-(1-R4)*(1-R5)))+(1-R3)*
                 (1-(1-R1*R4)*(1-R2*R5)))*(1-(1-R6*R7)*(1-R8)*
                  (1-R9)))/t[i]
  }
  return(rep)
}

t= seq(0.1, 20, 0.1)
lambda=20
beta=2
#ln_surv(lambda,beta,t)

g <- ggplot() +
  geom_line(aes(x = seq(0.1, 20, 0.1), y = ln_surv(20, 2, seq(0.1, 20, 0.1)))) +
```

```
  labs(x = "t",
       y = "-ln(F(t))/t")

g
```
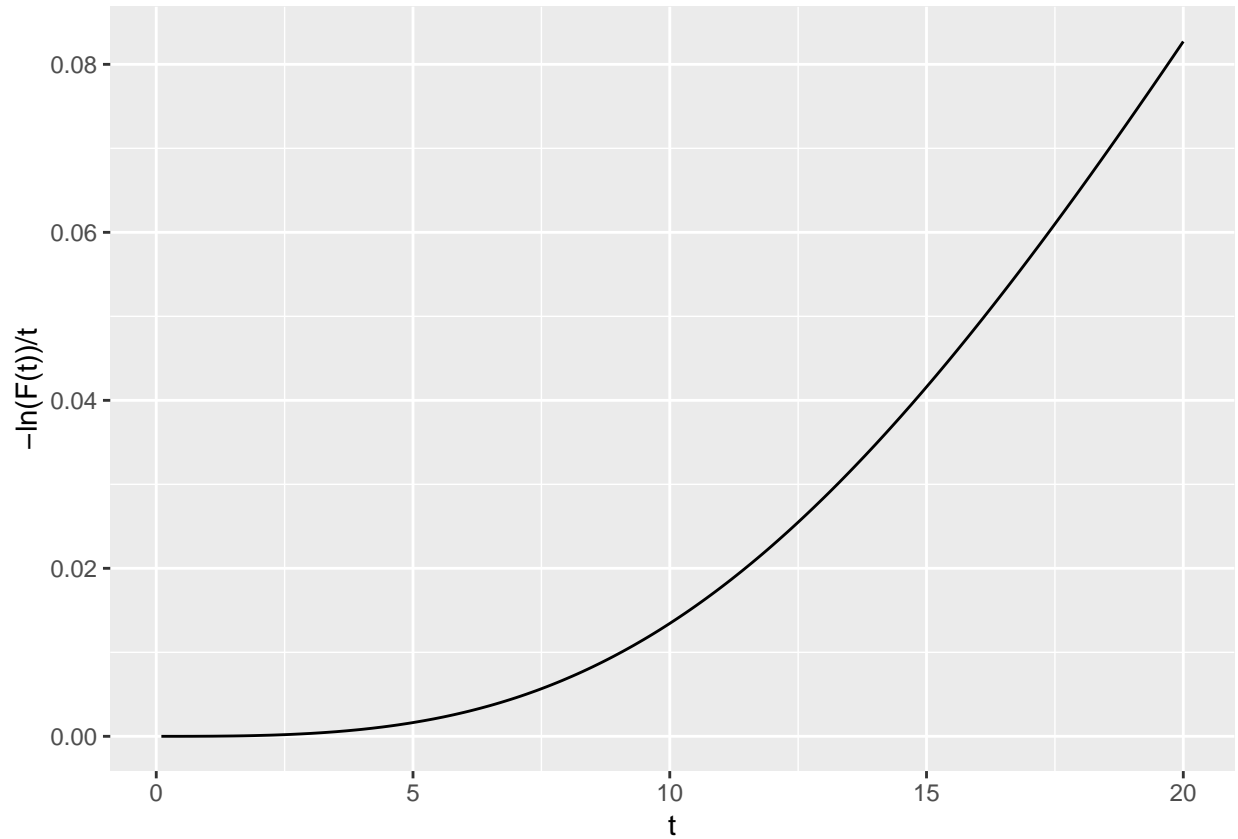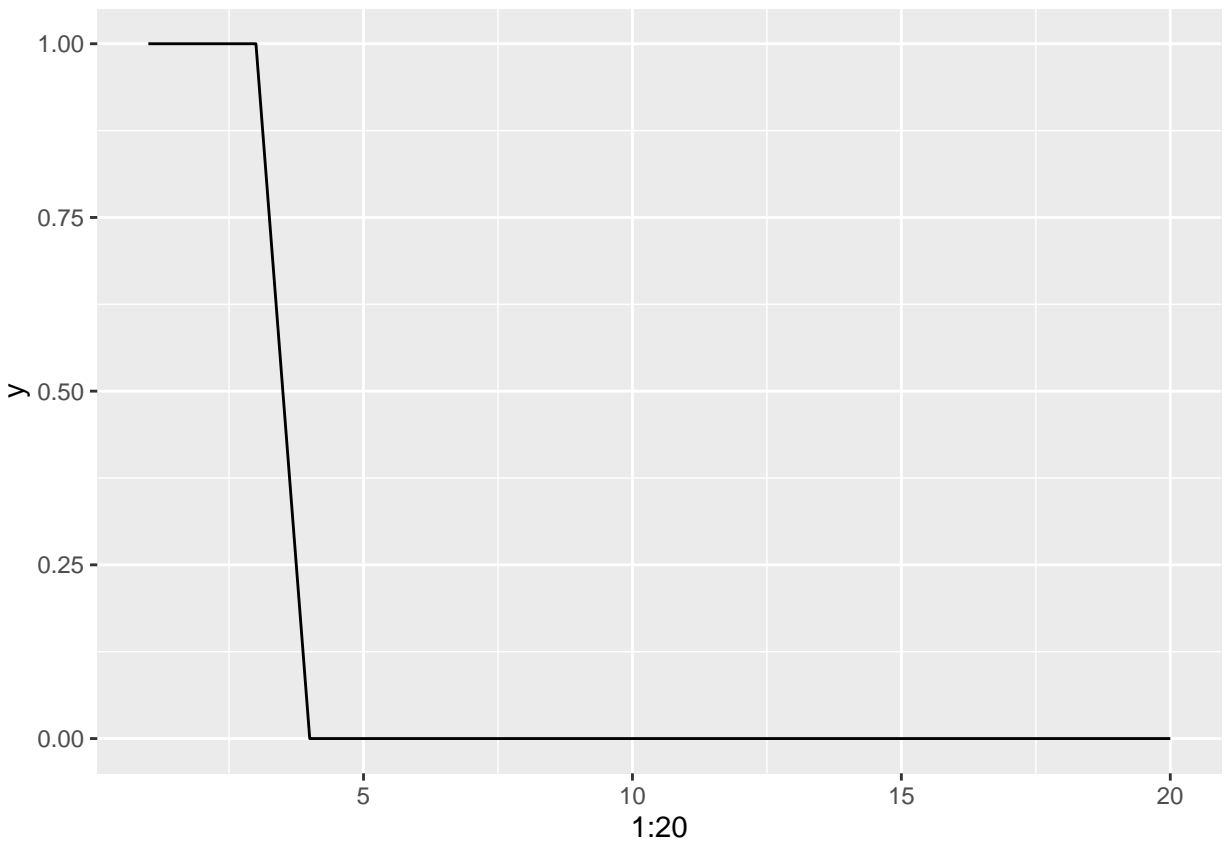


```
phi_t <- function(a, n, lambda, beta){
  t <- seq(0, a,length.out =n)
  y <- rep(0,n)
  u <- runif(9,0,1)
  x <- matrix(0, nrow = n, ncol = 9)

  for(i in 1:n){
    for(j in 1:9){
      if(t[i] < (lambda*(-log(u[j]))^(1/beta))){
        x[i,j] <- 1
      }
    }
    y[i] <- phi(x[i,])
  }
  return(y)
}

# phi_t(4,20,2,1)

g <- ggplot() +
  geom_line(aes(x = 1:20, y = phi_t(4,20,2,1))) +
```

```
  labs(y = "y")
g
```



```
duree_vie_sys <- function(a, n, lambda, beta){
  y<-phi_t(a, n, lambda, beta)
  d<-0
  for (i in n:1){
    if(y[i]==1 & i==n ){
      d=n
      break
    }
    if(y[i]==1){
      d=i+1
      break
    }
  }
  return(d)
}
```

```
duree_vie_sys(4,36,2,1)
```

```
## [1] 14
```

```
phi_t_b1 <- function(a, n, lambda, beta){
  t <- seq(0, a,length.out =n)
  y <- rep(0,n)
  u <- runif(5,0,1)
```

```r
  x <- matrix(0, nrow = n, ncol = 5)

  for(i in 1:n){
    for(j in 1:5){
      if(t[i] < (lambda*(-log(u[j]))^(1/beta))){
        x[i,j] <- 1
      }
    }
    y[i] <- phi_1(x[i,])
  }
  return(y)
}

# phi_t_b1(4,20,2,1)
```

```r
duree_vie_b1 <- function(a, n, lambda, beta){
  y<-phi_t_b1(a, n, lambda, beta)
  d<-0
  for (i in n:1){
    if(y[i]==1 & i==n ){
      d=n
      break
    }
    if(y[i]==1){
      d=i+1
      break
    }
  }
  return(d)
}
```

```r
duree_vie_b1(4,36,2,1)
```

```
## [1] 24
```

```r
phi_t_b2 <- function(a, n, lambda, beta){
  t <- seq(0, a,length.out =n)
  y <- rep(0,n)
  u <- runif(4,0,1)
  x <- matrix(0, nrow = n, ncol = 4)

  for(i in 1:n){
    for(j in 1:4){
      if(t[i] < (lambda*(-log(u[j]))^(1/beta))){
        x[i,j] <- 1
      }
    }
    y[i] <- phi_2(x[i,])
  }
  return(y)
}

# phi_t_b1(4,20,2,1)
```

7

```r
duree_vie_b1(4,36,2,1)
```

```
## [1] 15
```

```r
duree_vie_b2 <- function(a, n, lambda, beta){
  y<-phi_t_b2(a, n, lambda, beta)
  d<-0
  for (i in n:1){
    if(y[i]==1 & i==n ){
      d=n
      break
    }
    if(y[i]==1){
      d=i+1
      break
    }
  }
  return(d)
}
```

```r
n_realisation_T_sys<-function(a, n, lambda, beta,ntot){
  vect=NULL
  for(i in 1:ntot){
    vect[i]=duree_vie_sys(a, n, lambda, beta)
  }
  return(vect)
}

mu=function(a, n, lambda, beta,ntot){
  v=n_realisation_T_sys(a, n, lambda, beta,ntot)
  1/ntot*sum(v)
}
mu(4,36,2,1,40)
```

```
## [1] 15.55
```

```r
n_realisation_T_b1<-function(a, n, lambda, beta,ntot){
  vect=NULL
  for(i in 1:ntot){
    vect[i]=duree_vie_b1(a, n, lambda, beta)
  }
  return(vect)
}

mu_1=function(a, n, lambda, beta,ntot){
  v=n_realisation_T_b1(a, n, lambda, beta,ntot)
  1/ntot*sum(v)
}
mu_1(4,36,2,1,40)
```

```
## [1] 15.975
```

```r
n_realisation_T_b2<-function(a, n, lambda, beta,ntot){
  vect=NULL
  for(i in 1:ntot){
    vect[i]=duree_vie_b2(a, n, lambda, beta)
```

```r
  }
  return(vect)
}

mu_2=function(a, n, lambda, beta,ntot){
  v=n_realisation_T_b2(a, n, lambda, beta,ntot)
  1/ntot*sum(v)
}
mu_2(4,36,2,1,40)
```
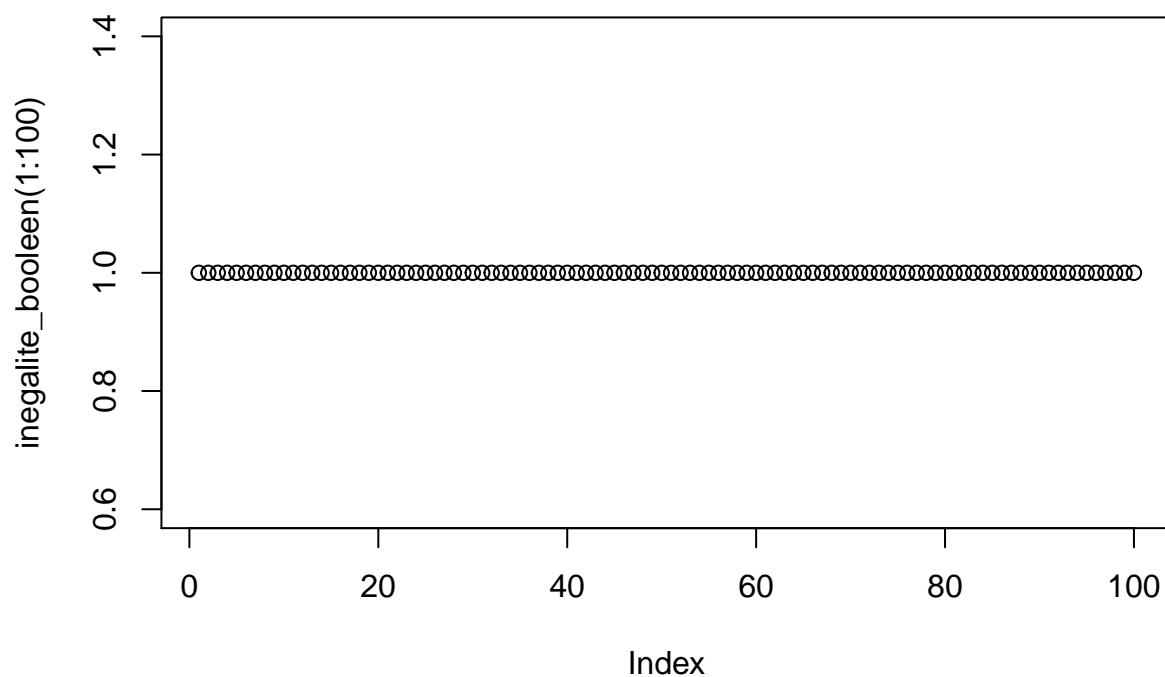
```
## [1] 22.275
```

```r
a_val=20
n_val=20
lambda_val=2
ntot_val=200

inegalite_booleen=function(beta,a=a_val, n=n_val, lambda=lambda_val,ntot=ntot_val){
  rep=NULL
  mu1=NULL
  mu2=NULL
  mu0=NULL
  s=NULL
  for(i in 1:length(beta)){
  mu1[i]=mu_1(a, n, lambda, beta[i],ntot)
  mu2[i]=mu_2(a, n, lambda, beta[i],ntot)
  mu0[i]=mu(a, n, lambda, beta[i],ntot)
  s[i]=((1/mu1[i])+(1/mu2[i]))^(-1)
  if(mu0[i]>=s[i]){

    rep[i]=TRUE
  }
  else{
    rep[i]=FALSE
  }
  }
  return(rep)
}
```

```r
plot(inegalite_booleen(1:100))
```

```r
a_val=20
n_val=20
lambda_val=2
ntot_val=200

inegalite=function(beta,a=a_val, n=n_val, lambda=lambda_val,ntot=ntot_val){
  rep=NULL
  mu1=NULL
  mu2=NULL
  mu0=NULL
  s=NULL
  for(i in 1:length(beta)){
  mu1[i]=mu_1(a, n, lambda, beta[i],ntot)
  mu2[i]=mu_2(a, n, lambda, beta[i],ntot)
  mu0[i]=mu(a, n, lambda, beta[i],ntot)
  s[i]=((1/mu1[i])+(1/mu2[i]))^(-1)
  rep[i]=mu0[i]-s[i]
  }
  return(rep)
}
```

```r
plot(inegalite(1:100))
```