Homework_3.R

onasa

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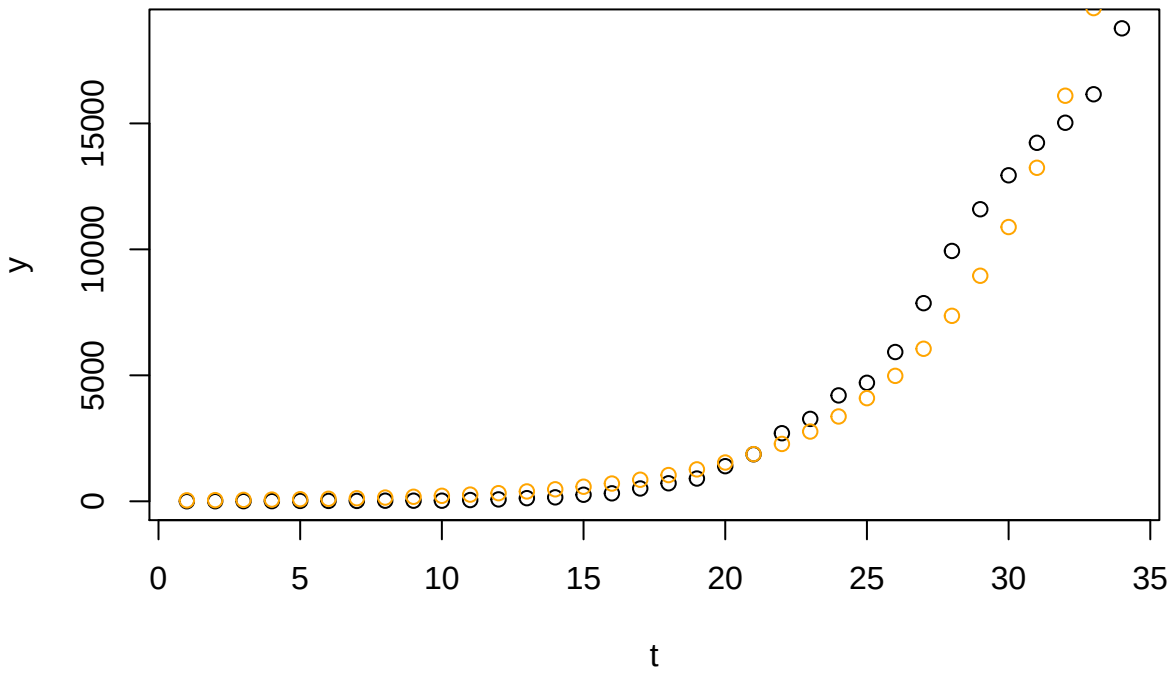
```
#Introduction of the data
y = c(2, 3, 5, 6, 15, 15, 15, 24, 24, 24, 49, 75, 124, 156, 260, 316, 509, 715, 903, 1394, 1866,
      2702, 3270, 4203, 4704, 5925, 7864, 9937, 11592, 12940, 14230, 15026, 16157, 18773)

t = seq(1,34)
t2 = seq(1,34)*seq(1,34)

#Using glm
#A1
fit = glm(formula = y~t, family=poisson)
summary(fit)
```

```
##
## Call:
## glm(formula = y ~ t, family = poisson)
##
## Deviance Residuals:
##    Min      1Q  Median      3Q     Max
## -33.88  -14.82   -9.39    8.62   28.48
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) 3.4273221  0.0164555   208.3   <2e-16 ***
## t           0.1955985  0.0005516   354.6   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for poisson family taken to be 1)
##
##     Null deviance: 249882.8  on 33  degrees of freedom
## Residual deviance:   8202.5  on 32  degrees of freedom
## AIC: 8473.1
##
## Number of Fisher Scoring iterations: 5
```

```
plot(t,y)
lines(t,fit$fitted.values,type="p", col="orange")
```

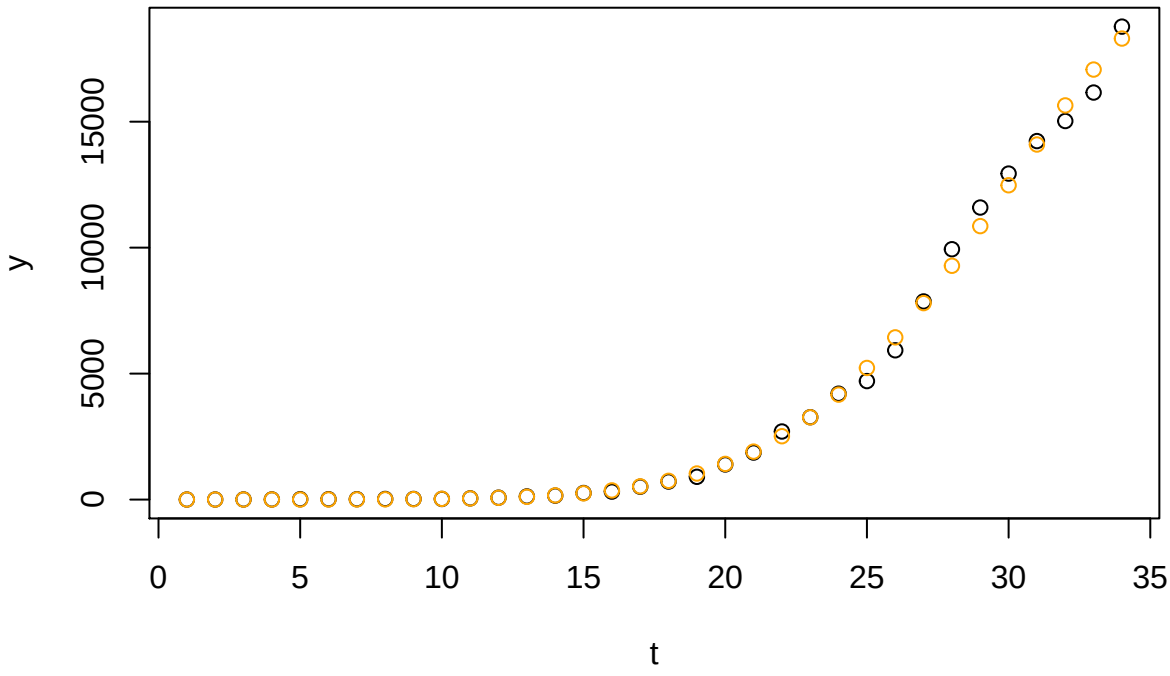



```
#A2
fit = glm(formula = y~t+t2, family=poisson)
summary(fit)
```

```
##
## Call:
## glm(formula = y ~ t + t2, family = poisson)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -7.3251  -0.8112   0.7464   3.3639   7.0025
##
## Coefficients:
##               Estimate Std. Error z value Pr(>|z|)
## (Intercept) -2.3189932  0.0862967  -26.87   <2e-16 ***
## t            0.6527898  0.0064178  101.72   <2e-16 ***
## t2          -0.0087034  0.0001177  -73.92   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for poisson family taken to be 1)
##
##     Null deviance: 249882.81  on 33  degrees of freedom
## Residual deviance:    453.52  on 31  degrees of freedom
## AIC: 726.09
##
```

```
## Number of Fisher Scoring iterations: 4
```

```
plot(t,y)
lines(t,fit$fitted.values,type="p", col="orange")
```




```
#Using nlm
#A1
loglik<-function(beta){
  mu=exp(-beta[1]-beta[2]*t)
  loglik=-sum(-mu + y*log(mu))
  (loglik)}

llike = nlm(loglik,p=c(0,0), hessian=T)
```

```
## Warning in nlm(loglik, p = c(0, 0), hessian = T): NA/Inf replaced by maximum
## positive value

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## positive value

## Warning in nlm(loglik, p = c(0, 0), hessian = T): NA/Inf replaced by maximum
## positive value
```
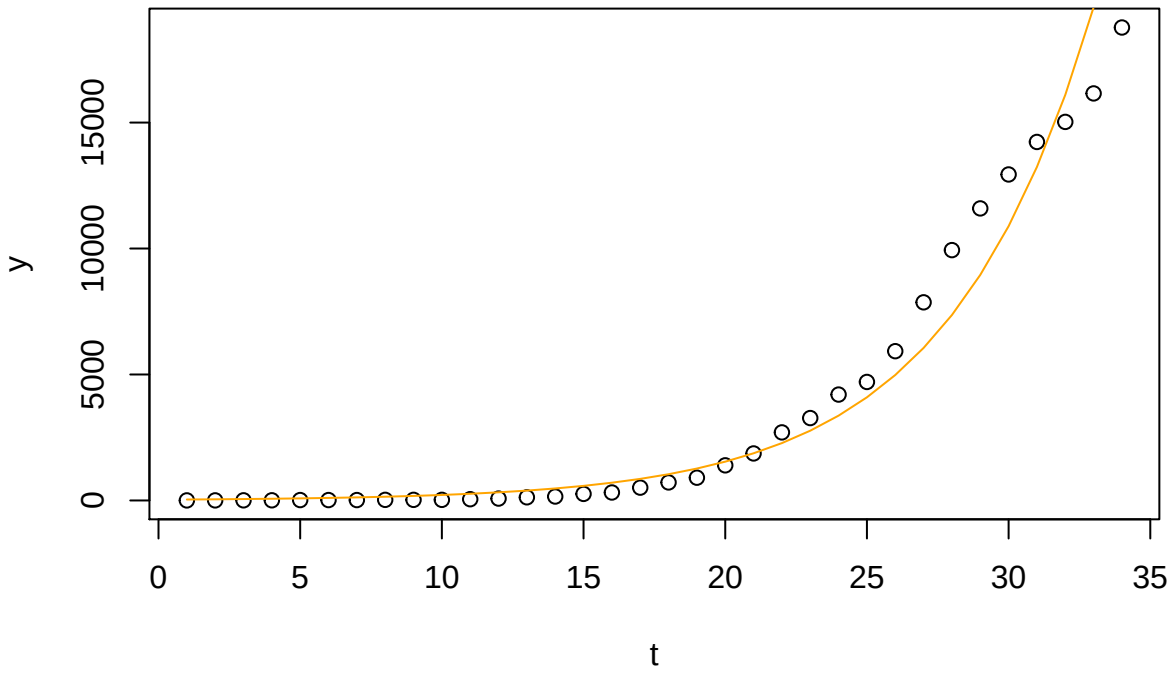

```
llike$estimate = -llike$estimate

plot1 = function(t){
  y = exp(llike$estimate[1]+llike$estimate[2]*t)
  return(y)
```

```
}

plot(t, y)
points(t,plot1(t), type = 'l', col='orange')
```




```
#A2
loglik<-function(beta){
  mu=exp(beta[1]+beta[2]*t+beta[3]*t2)
  loglik=-sum(-mu + y*log(mu))
  (loglik)}

llike = nlm(loglik,p=c(0,0,0), hessian=T)
```

```
## Warning in nlm(loglik, p = c(0, 0, 0), hessian = T): NA/Inf replaced by maximum
## positive value
```

```
## Warning in nlm(loglik, p = c(0, 0, 0), hessian = T): NA/Inf replaced by maximum
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```

```
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```

```
## Warning in nlm(loglik, p = c(0, 0, 0), hessian = T): NA/Inf replaced by maximum
## positive value
```

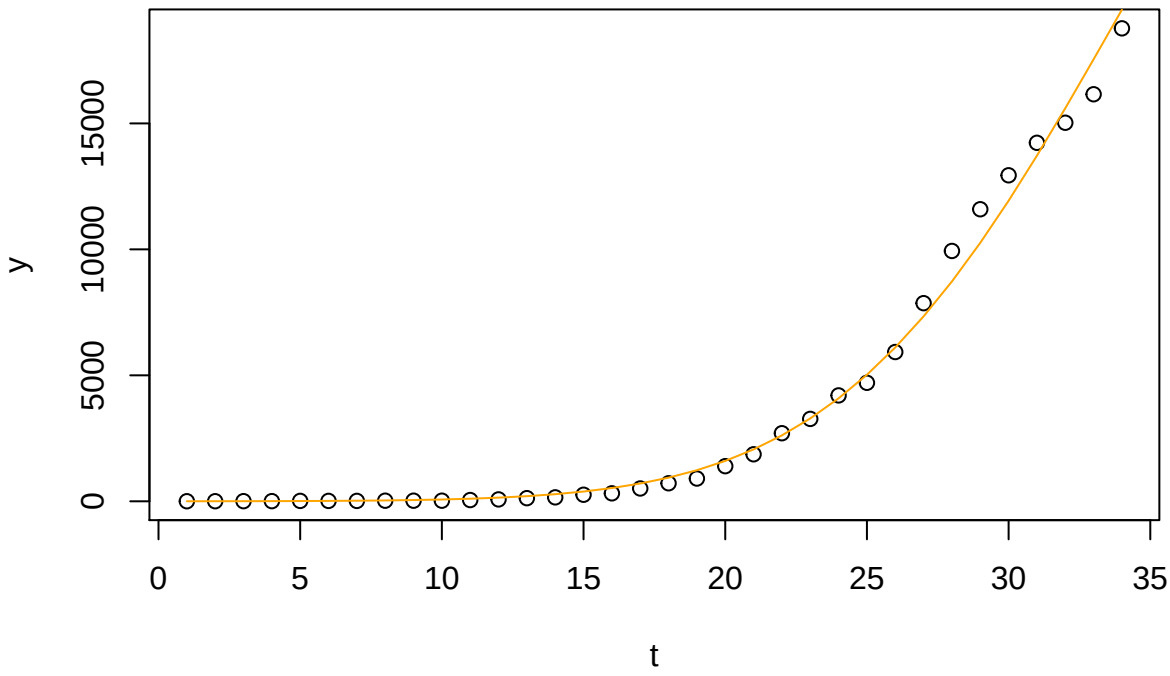
```
llike
```

```
## $minimum
```

```
## [1] -1098237
##
## $estimate
## [1]  0.033420390  0.478314608 -0.005551174
##
## $gradient
## [1]   333.9928 -2780.7593 73249.9908
##
## $hessian
##             [,1]       [,2]         [,3]
## [1,]    134170.4    3939745    123604601
## [2,]   3939744.9  118232718   3774962372
## [3,] 123604601.0 3774962372 122328471035
##
## $code
## [1] 3
##
## $iterations
## [1] 17
```

```
plot1 = function(t){
  y = exp(llike$estimate[1]+llike$estimate[2]*t+llike$estimate[3]*t2)
  return(y)
}

plot(t, y)
points(t,plot1(t), type = 'l', col='orange')
```




```
# predicted day for which the speed of growing = 0
variable_t<-data.frame(temps=seq(35,100))
variable_t
```

```
##    temps
## 1     35
## 2     36
## 3     37
## 4     38
## 5     39
## 6     40
## 7     41
## 8     42
## 9     43
## 10    44
## 11    45
## 12    46
## 13    47
## 14    48
## 15    49
## 16    50
## 17    51
## 18    52
## 19    53
## 20    54
## 21    55
```

```
## 22    56
## 23    57
## 24    58
## 25    59
## 26    60
## 27    61
## 28    62
## 29    63
## 30    64
## 31    65
## 32    66
## 33    67
## 34    68
## 35    69
## 36    70
## 37    71
## 38    72
## 39    73
## 40    74
## 41    75
## 42    76
## 43    77
## 44    78
## 45    79
## 46    80
## 47    81
## 48    82
## 49    83
## 50    84
## 51    85
## 52    86
## 53    87
## 54    88
## 55    89
## 56    90
## 57    91
## 58    92
## 59    93
## 60    94
## 61    95
## 62    96
## 63    97
## 64    98
## 65    99
## 66   100
```

```
linear_model<-glm(formula = y~t, family=poisson)
summary(linear_model)
```

```
##
## Call:
## glm(formula = y ~ t, family = poisson)
##
## Deviance Residuals:
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## AIC: 8473.1
##
## Number of Fisher Scoring iterations: 5
```

```
tururu = predict(linear_model, newdata=variable_t)
```

```
## Warning: 'newdata' had 66 rows but variables found have 34 rows
```

```
tururu
```

```
##         1         2         3         4         5         6         7         8
##  3.622921  3.818519  4.014118  4.209716  4.405315  4.600913  4.796512  4.992110
##         9        10        11        12        13        14        15        16
##  5.187709  5.383307  5.578906  5.774504  5.970103  6.165701  6.361299  6.556898
##        17        18        19        20        21        22        23        24
##  6.752496  6.948095  7.143693  7.339292  7.534890  7.730489  7.926087  8.121686
##        25        26        27        28        29        30        31        32
##  8.317284  8.512883  8.708481  8.904080  9.099678  9.295277  9.490875  9.686474
##        33        34
##  9.882072 10.077671
```