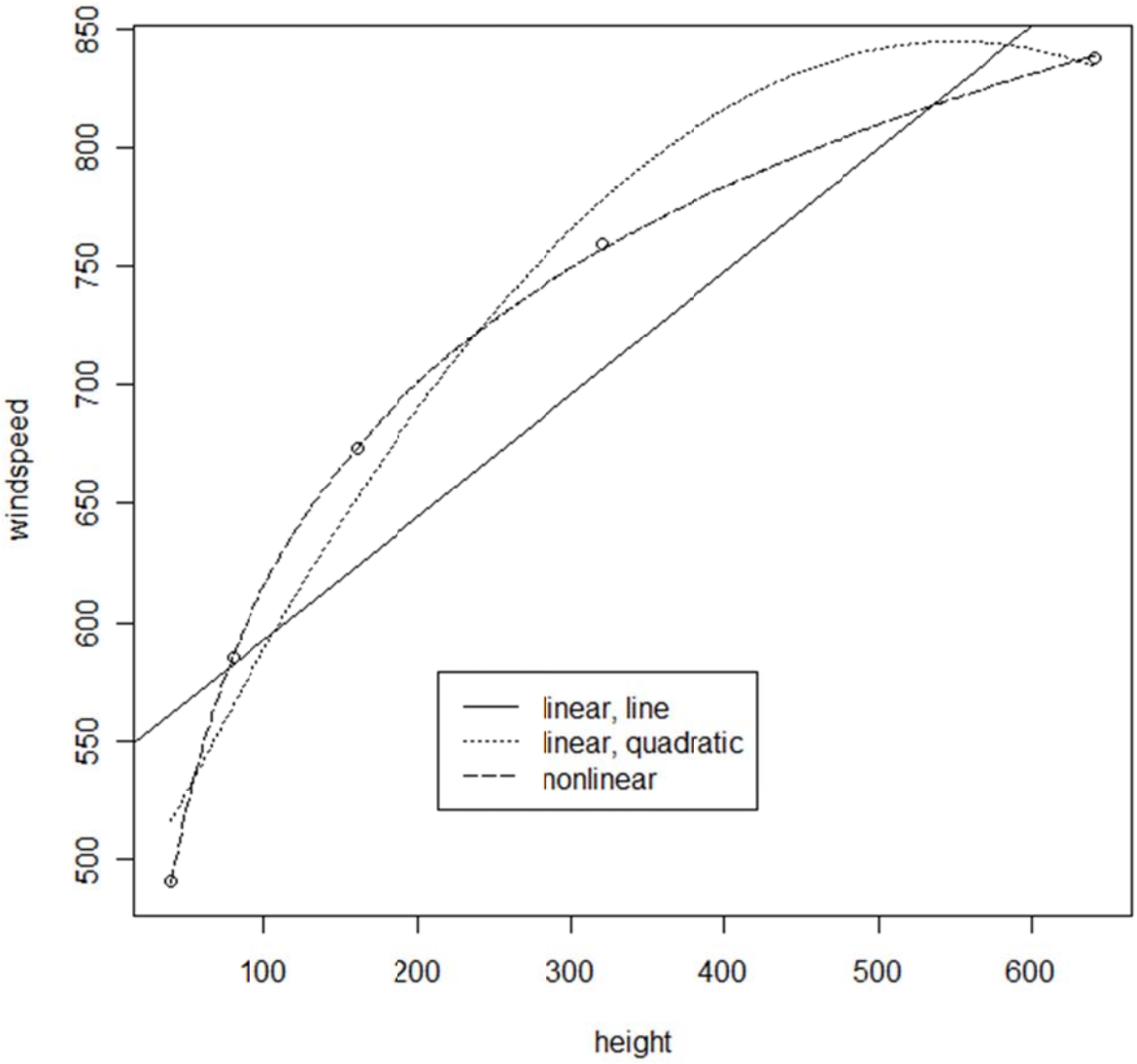
```
> ############
> # wind1   #
> ############
>
> wind <- read.table(file = "winddata.dat", header = T)
> attach(wind)
> wind
  height windspeed
1     40     490.2
2     80     585.3
3    160     673.7
4    320     759.2
5    640     837.5
> plot(height, windspeed)
> m1wind.lm <- lm(windspeed ~ height)
> summary(m1wind.lm)

Call:
lm(formula = windspeed ~ height)

Residuals:
     1      2      3      4      5
-71.184   3.186  50.126  52.706 -34.834

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 540.6542    42.0637   12.85  0.00102 **
height        0.5182     0.1273    4.07  0.02676 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 62.13 on 3 degrees of freedom
Multiple R-squared: 0.8467,     Adjusted R-squared: 0.7955
F-statistic: 16.56 on 1 and 3 DF,  p-value: 0.02676

> abline(m1wind.lm)
> m2wind.lm <- lm(windspeed ~ height + I(height^2))
> summary(m2wind.lm)

Call:
lm(formula = windspeed ~ height + I(height^2))

Residuals:
     1      2      3      4      5
-25.637  19.887  21.279 -18.651   3.122

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
```

```
(Intercept)  4.622e+02  3.189e+01  14.495  0.00473 **
height       1.391e+00  2.774e-01   5.015  0.03754 *
I(height^2) -1.265e-03  3.917e-04  -3.230  0.08396 .
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 30.52 on 2 degrees of freedom
Multiple R-squared: 0.9753,     Adjusted R-squared: 0.9507
F-statistic: 39.54 on 2 and 2 DF,  p-value: 0.02467

> x0 <- seq(from = 40, to = 640, by = 1)
> X0 <- cbind(rep(1, 601), x0, x0^2)
> lines(x0, X0 %*% coef(m2wind.lm), lty = 3)
> m1wind.nls <- nls(windspeed ~ theta1 * log(height*(1-theta2/theta3) - 1/theta3),
+   start = c(theta1 = 100, theta2 = -.05, theta3 = 0.05))
> summary(m1wind.nls)

Formula: windspeed ~ theta1 * log(height * (1 - theta2/theta3) - 1/theta3)

Parameters:
       Estimate Std. Error t value Pr(>|t|)
theta1 115.146883   2.040556  56.429 0.000314 ***
theta2  -0.059497   0.005456 -10.904 0.008305 **
theta3   0.045395   0.013208   3.437 0.075227 .
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1.873 on 2 degrees of freedom

Number of iterations to convergence: 3
Achieved convergence tolerance: 8.175e-06

> thetahat <- coef(m1wind.nls)
> y0 <- thetahat[1] * log(x0*(1-thetahat[2]/thetahat[3]) - 1/thetahat[3])
> lines(x0,y0,lty=5)
> legend(locator(1),legend = c("linear, line", "linear, quadratic", "nonlinear"),
+        lty = c(1, 3, 5))
>
```


windspeed
500
550
600
650
700
750
800
850
100
200
300
400
500
600
height
linear, line
linear, quadratic
nonlinear