Question 3

a) R script:

```r
#a) define x and y
y <- log(pres)
x <- 1 / (temp - 10)
```

b) R script

```r
#b) fit the model
fit <- lm(y ~ x)
summary(fit)
```

R output:

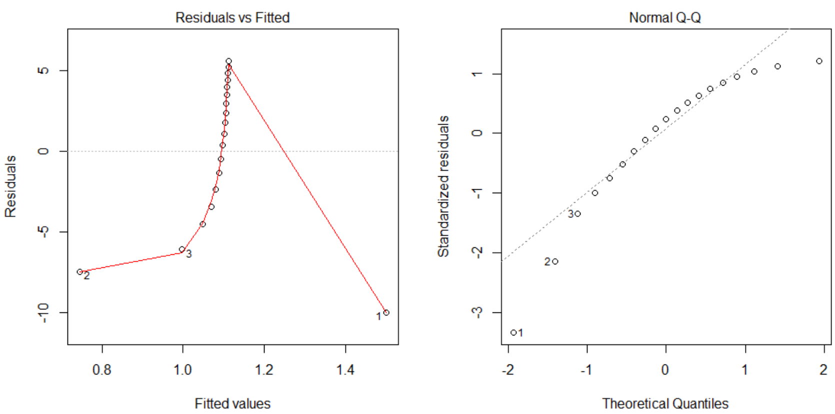
```
> fit <- lm(y ~ x)
> summary(fit)

Call:
lm(formula = y ~ x)

Residuals:
    Min      1Q  Median      3Q     Max 
-10.017  -2.933   1.074   3.702   5.580 

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)    1.123      1.114   1.008    0.327
x             -3.769     32.577  -0.116    0.909

Residual standard error: 4.735 on 17 degrees of freedom
Multiple R-squared:  0.0007869, Adjusted R-squared:  -0.05799 
F-statistic: 0.01339 on 1 and 17 DF,  p-value: 0.9092
```

We can get the estimates of alpha is 1.123, and the estimates of beta is -3.769.

c) R script:

```r
#c) plot diagnostic plots
par(mfrow = c(1, 2))
plot(fit, 1:2)
```

R output:



The linear model looks approximately appropriate from the QQ plot, because most of points are on the straight line except some points.

d) R script:

```
#d) 95% CI
confint(fit)
```

R output:

```
> confint(fit)
                 2.5 %    97.5 %
(Intercept)  -1.226584  3.471995
x           -72.500778 64.961925
```

We can find that 4.86 is not in the 95% CI for alpha (-1,22,3.47), and -3007 is not in the 95% CI for beta (-72.50,64.96); therefore, this model doesn't support these two claims.

e) R script:

```
#e) CI
newdata = data.frame(x = 1 / (70 - 10))
predict(fit,newdata,interval = "confidence", level = 0.95)
```

R output:

```
> newdata = data.frame(x = 1 / (70 - 10))
>
> predict(fit,newdata,interval = "confidence", level = 0.95)
       fit       lwr      upr
1 1.059882 -1.316822 3.436586
```

We can find 95% CI for pressure when temperature is 70 degrees Celsius is (-1.32,3.43).

f) R script:

```
#f) PI
predict(fit,newdata,interval = "predict", level = 0.95)
```

R output:

```
> predict(fit,newdata,interval = "predict", level = 0.95)
       fit       lwr      upr
1 1.059882 -9.208992 11.32876
```

We can find 95% PI for pressure when temperature is 70 degrees Celsius is (-9.21,11.33).

Question 6

a) R:

```
# a) Type I error
ppois(3,2,lower.tail = FALSE)
```

R output:

```
> ppois(3,2,lower.tail = FALSE)
[1] 0.1428765
```

b) R:

```
# b) Type II error when lambda = 5
ppois(3,5,lower.tail = TRUE)
```

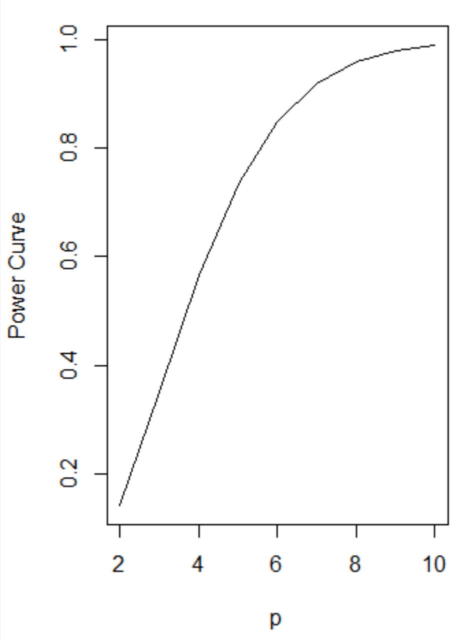
R output:

```
> ppois(3,5,lower.tail = TRUE)
[1] 0.2650259
```

c) R:

```
# c) Draw power curve of lambda between 2 to 10

K1 <- function(p)
  1 - ppois(3,p)

p <- seq(2,10,0.1)
K <- K1(p)
plot(p,K,type = "l", ylab = "Power Curve")
```

R output:



d) R:

```
K1(3)
K1(4)
K1(2)
K1(1)
K1(1.5)
K1(1.6)
K1(1.4)
K1(1.3)
K1(1.35)
K1(1.36)
K1(1.37)
```

R output:

```
> K1(3)
[1] 0.3527681
> K1(4)
[1] 0.5665299
> K1(2)
[1] 0.1428765
> K1(1)
[1] 0.01898816
> K1(1.5)
[1] 0.06564245
> K1(1.6)
[1] 0.07881349
> K1(1.4)
[1] 0.05372525
> K1(1.3)
[1] 0.04309545
> K1(1.35)
[1] 0.04824799
> K1(1.36)
[1] 0.04931753
> K1(1.37)
[1] 0.05040005
```

The actual significance level is 0.05040005 when lambda is 1.37