Assignment 3

anonymous

1 General information

2 Inference for normal mean and deviation (3 points)

Loading the library and the data.

```
data("windshieldy1")
# The data are now stored in the variable `windshieldy1`.
# The below displays the data:
windshieldy1
```

```
[1] 13.357 14.928 14.896 15.297 14.820 12.067 14.824 13.865 17.447
```

The below data is **only for the tests**, you need to change to the full data `windshieldy1` when reporting your results.

```
windshieldy_test <- c(13.357, 14.928, 14.896, 14.820)
```

2.1 (a)

Write your answers here!

2.2 (b)

Write your answers and code here!

Keep the below name and format for the functions to work with `markmyassignment`:

```
# Useful functions: mean(), length(), sqrt(), sum()
# and qtnew(), dtnew() (from aaltobda)

mu_point_est <- function(data) {
    # Do computation here, and return as below.
    # This is the correct return value for the test data provided above.
    14.5

}
mu_interval <- function(data, prob = 0.95) {
    # Do computation here, and return as below.
```

```r
    # This is the correct return value for the test data provided above.
    c(13.3, 15.7)

}
```

You can plot the density as below if you implement `mu_pdf` to compute the PDF of the posterior $p(\mu|y)$ of the average hardness μ.

```r
mu_pdf <- function(data, x){
    # Compute necessary parameters here.
    # These are the correct parameters for `windshieldy_test`
    # with the provided uninformative prior.
    df = 3
    location = 14.5
    scale = 0.3817557
    # Use the computed parameters as below to compute the PDF:

    dtnew(x, df, location, scale)
}

x_interval = mu_interval(windshieldy1, .999)
lower_x = x_interval[1]
upper_x = x_interval[2]
x = seq(lower_x, upper_x, length.out=1000)
plot(
    x, mu_pdf(windshieldy1, x), type="l",
    xlab=TeX(r'(average hardness $\mu$)'),
    ylab=TeX(r'(PDF of the posterior $p(\mu|y)$)')
)
```

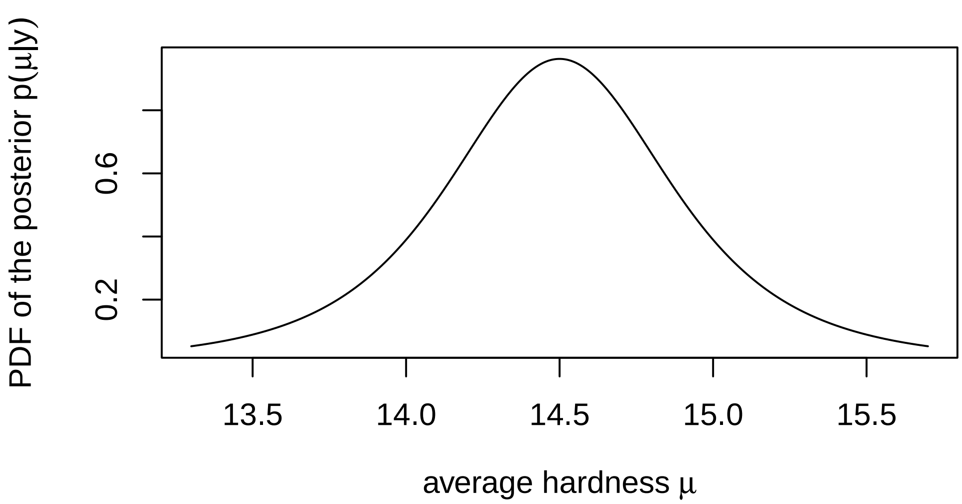

Figure 1: PDF of the posterior $p(\mu|y)$ of the average hardness μ

2.3 (c)

Write your answers and code here!

Keep the below name and format for the functions to work with `markmyassignment`:

```r
# Useful functions: mean(), length(), sqrt(), sum()
# and qtnew(), dtnew() (from aaltobda)

mu_pred_point_est <- function(data) {
    # Do computation here, and return as below.
    # This is the correct return value for the test data provided above.
    14.5

}
mu_pred_interval <- function(data, prob = 0.95) {
    # Do computation here, and return as below.
    # This is the correct return value for the test data provided above.
    c(11.8, 17.2)

}
```

You can plot the density as below if you implement `mu_pred_pdf` to compute the PDF of the posterior predictive $p(\tilde{y}|y)$ of a new hardness observation $\tilde{y}$.

```r
mu_pred_pdf <- function(data, x){
    # Compute necessary parameters here.
    # These are the correct parameters for `windshieldy_test`
    # with the provided uninformative prior.
    df = 3
    location = 14.5
    scale = 0.8536316
    # Use the computed parameters as below to compute the PDF:

    dtnew(x, df, location, scale)
}

x_interval = mu_pred_interval(windshieldy1, .999)
lower_x = x_interval[1]
upper_x = x_interval[2]
x = seq(lower_x, upper_x, length.out=1000)
plot(
    x, mu_pred_pdf(windshieldy1, x), type="l",
    xlab=TeX(r'(new hardness observation $\tilde{y}$)'),
    ylab=TeX(r'(PDF of the posterior predictive $p(\tilde{y}|y)$)')
)
```

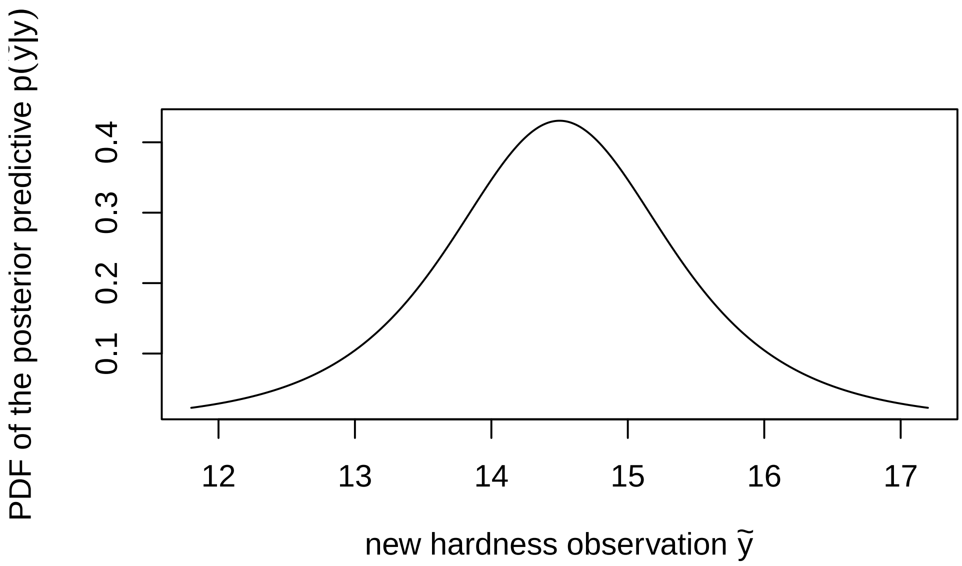

Figure 2: PDF of the posterior predictive $p(\tilde{y}|y)$ of a new hardness observation $\tilde{y}$

3 Inference for the difference between proportions (3 points)

3.1 (a)

Write your answers here!

3.2 (b)

Write your answers and code here!

The below data is **only for the tests**:

```
set.seed(4711)
ndraws = 1000
p0 = rbeta(ndraws, 5, 95)
p1 = rbeta(ndraws, 10, 90)
```

Keep the below name and format for the functions to work with `markmyassignment`:

```
# Useful function: mean(), quantile()

posterior_odds_ratio_point_est <- function(p0, p1) {
    # Do computation here, and return as below.
    # This is the correct return value for the test data provided above.
    2.650172

}
posterior_odds_ratio_interval <- function(p0, p1, prob = 0.95) {
```

```r
    # Do computation here, and return as below.
    # This is the correct return value for the test data provided above.
    c(0.6796942,7.3015964)

}
```

3.3 (c)

Write your answers and code here!

4 Inference for the difference between normal means (3 points)

Loading the library and the data.

```r
data("windshieldy2")
# The new data are now stored in the variable `windshieldy2`.
# The below displays the first few rows of the new data:
head(windshieldy2)
```

```
[1] 15.980 14.206 16.011 17.250 15.993 15.722
```

4.1 (a)

Write your answers here!

4.2 (b)

Write your answers and code here!

```r
# Useful functions: mean(), length(), sqrt(), sum(),
# rtnew() (from aaltobda), quantile() and hist().
```

4.3 (c)

Write your answers here!