

Assignment 1

2. LaTeX

(a) $E(Y) = y_1 p_1 + \dots + y_k p_k = \sum_{i=1}^k y_i p_i$

(b) $\sigma_y = Var(Y) = E[(Y - \mu_y)^2] = \sum_{i=1}^k (y_i - \mu_y)^2 p_i$

(c) $\hat{\beta} = \frac{\sum_{i=1}^n (y_i - y_i)(x_i - x_i)}{\sum_{i=1}^n (x_i - x_i)^2}$

(d) $P(a \leq Y \leq b) = \int_a^b f_y(y) dy$

(e) $\hat{g}(x) = \frac{\frac{1}{nh} \sum_{i=1}^n y_i k(\frac{x_i - x}{h})}{\frac{1}{nh} \sum_{i=1}^n k(\frac{x_i - x}{h})}$

3. R

(a)

```
n <- 1000
```

(b)

```
u_1 <- runif(500,0,1)
u_2 <- runif(500,0,1)
```

(c)

```
z_1 <- sqrt(-2 * log(u_1)) * cos(2 * pi * u_2)
z_2 <- sqrt(-2 * log(u_1)) * sin(2 * pi * u_2)
```

(d)

```
z <- c(z_1, z_2)
```

(e)

```
mu <- 5  
sigma <- 2
```

(f)

```
x <- mu + sigma * z
```

(g)

```
mean(x)
```

```
[1] 5.014135
```

```
sd(x)
```

```
[1] 1.972685
```

(h)

```
hist(x,  
      freq = FALSE,  
      ylab = "Density",  
      xlab = "$x$")  
curve(dnorm(x, mean = mu, sd = sigma),  
      col = "red", lwd = 2, add = TRUE)
```

