

STAT 428 Homework 0: Solution

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Exercise

Below are a few toy problems. You can type your answers under each problem. If you like, you can submit your .Rmd and .pdf files on Gradescope. I'll read them.

Problem 1

- (a) Using bullet points, list two reasons you are taking this course.
- This is one of my major requirements.
 - I want to further understand the importance of statistics and its application in ML while developing my R skills.
- (b) Using a numbered list, tell me two things about you (e.g., what you are interested in, what you do for fun during the pandemic, any questions/concerns about the course).
- (1) I love playing soccer and have my own youtube channel
 - (2) I have one dog which is a maltese

Problem 2

What is the PDF of a normal RV $X \sim N(\mu, \sigma^2)$? Write it as a LaTeX equation block.

$$f_X(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-\mu)^2}{2\sigma^2}}, \quad -\infty < x < \infty$$

Problem 3

Make a code chunk: Create a function that takes x, μ, σ as inputs and outputs $f(x)$, the density of x under $N(\mu, \sigma^2)$. Try not to use built-in functions like `dnorm()`.

```
norm_density <- function(x, mu, sigma){  
  d = 1/(sqrt(2*pi)*sigma)*exp(-(x-mu)^2/(2*sigma^2))  
  return(d)  
}
```

```
# Check: does it produce same value as dnorm?
```

```
# f(1) for  $X \sim N(0, 1^2)$   
norm_density(x=1, mu=0, sigma=1)
```

```
## [1] 0.2419707
```

```
dnorm(1, mean = 0, sd = 1)
```

```
## [1] 0.2419707
```

```
# f(5) for  $X \sim N(3, 5^2)$   
norm_density(x=5, mu=3, sigma=5)
```

```
## [1] 0.07365403
```

```
dnorm(5, mean = 3, sd = 5)
```

```
## [1] 0.07365403
```

Problem 4

Make a code chunk: Using the function from Problem 3, plot the PDF of $X \sim N(0, 1)$ between -4 and 4 .

```
x = seq(-4, 4, .01)  
fx = norm_density(x, mu=0, sigma=1)  
plot(x, fx, type = 'l', xlab = 'x', ylab = 'f(x)')
```

