Homework 1

Question 1:

Defines variables a=1,b=−1,d=−2 and print out the solutions to

$$\mathbf{f(x) = ax^2 + bx + d = 0}$$

Do not report complex solutions, only real numbers. Avoid using the variable name c as it is a reserved function in R. Show the code and the answer.

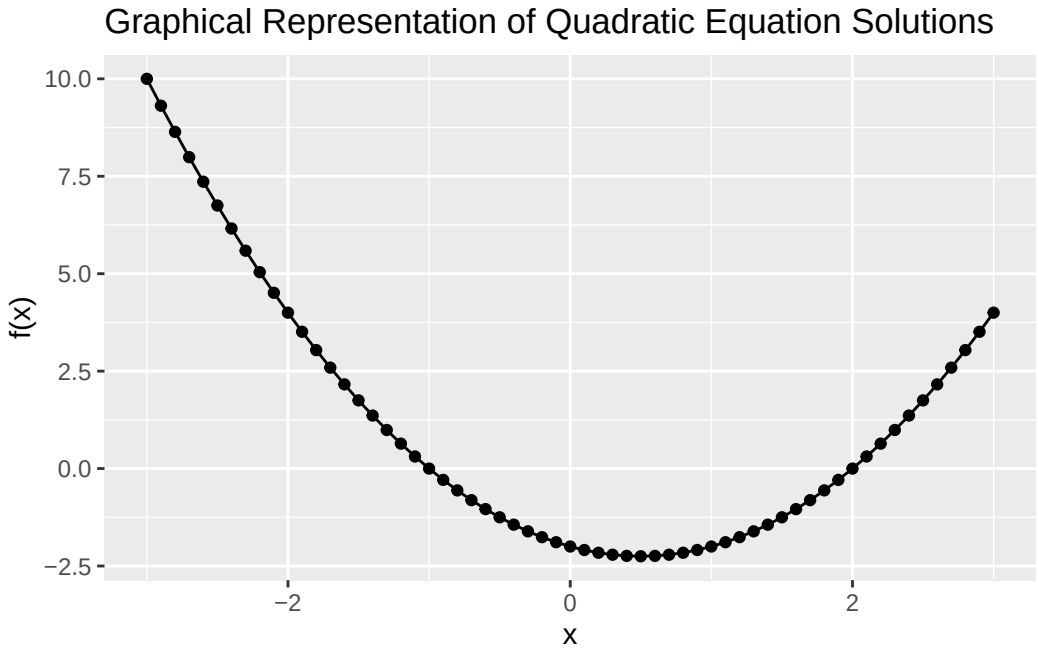
Solution:

```
a <- 1
b <- -1
f <- -2

# Solve quadratic equation
solution <- quadratic_eq <- function(a, b, f) {
  discriminant <- b^2 - 4*a*f
  if (discriminant >= 0) {
    root1 <- (-b + sqrt(discriminant)) / (2*a)
    root2 <- (-b - sqrt(discriminant)) / (2*a)
    return(c(root1, root2))
  } else {
    return(NA)  # No real roots
  }
}
roots <- solution(a, b, f)
print(roots)
```

```
[1]  2 -1
```

Question 2:

Show a graph of f(x) versus x for x (−3,3). Do not show the code, only the graph.



Question 3:

Generate PDF report using Render

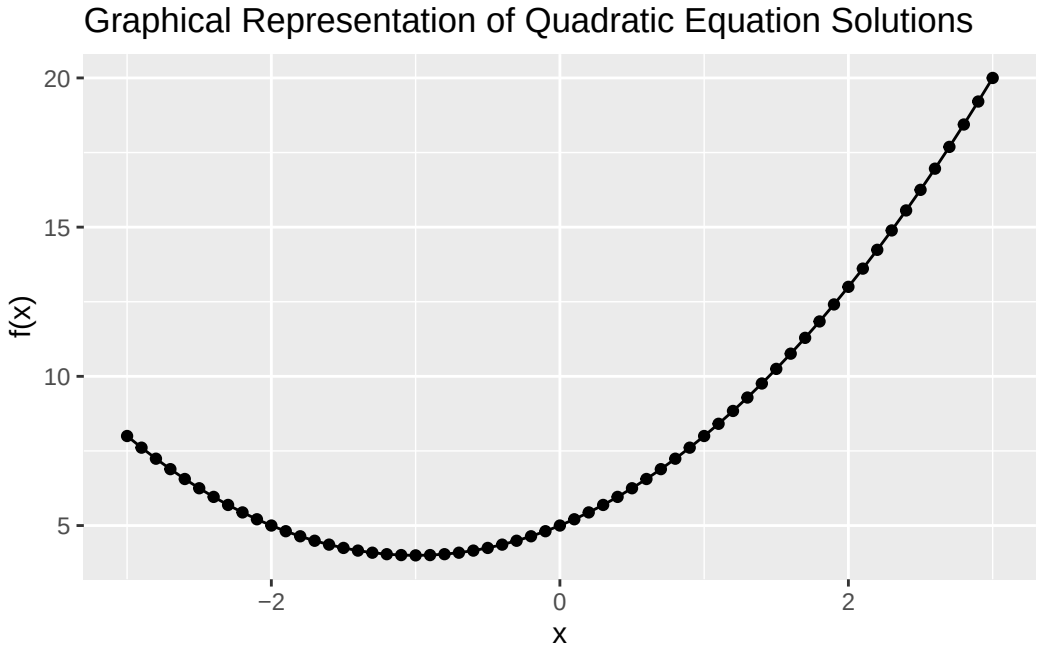
Question 4:

Erase the PDF report and reproduce it but this time using a=1,b=2,c=5.

```
a <- 1
b <- 2
f <- 5

# Solve quadratic equation
solution <- quadratic_eq <- function(a, b, f) {
  discriminant <- b^2 - 4*a*f
  if (discriminant >= 0) {
    root1 <- (-b + sqrt(discriminant)) / (2*a)
```

```
    root2 <- (-b - sqrt(discriminant)) / (2*a)
    return(c(root1, root2))
  } else {
    return(NA)  # No real roots
  }
}
roots <- solution(a, b, f)
print(roots)
```

```
[1] NA
```



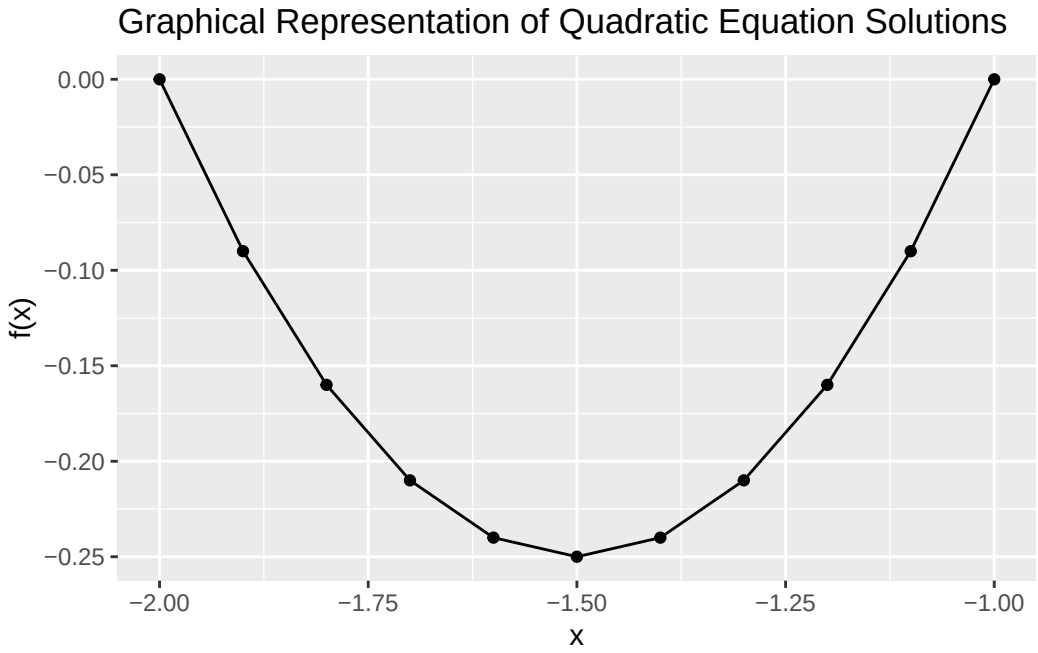
Question 5:

Erase the PDF report and reproduce it but this time using a=1,b=3,c=2. Change the range of x to range that clearly shows the roots.

```
a <- 1
b <- 3
f <- 2

# Solve quadratic equation
```

```r
solution <- quadratic_eq <- function(a, b, f) {
  discriminant <- b^2 - 4*a*f
  if (discriminant >= 0) {
    root1 <- (-b + sqrt(discriminant)) / (2*a)
    root2 <- (-b - sqrt(discriminant)) / (2*a)
    return(c(root1, root2))
  } else {
    return(NA)  # No real roots
  }
}
roots <- solution(a, b, f)
print(roots)
```

```
[1] -1 -2
```



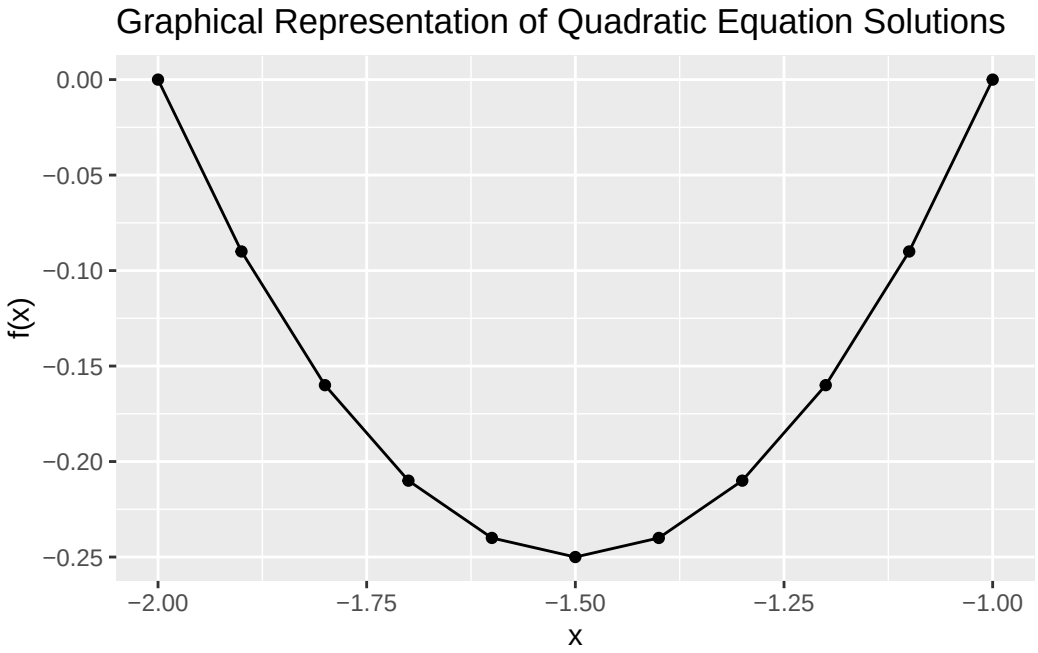
Question 6:

Create a markdown page with the results for this last set of values, but this time showing the code.

```r
a <- 1
b <- 3
f <- 2

# Solve quadratic equation
solution <- quadratic_eq <- function(a, b, f) {
  discriminant <- b^2 - 4*a*f
  if (discriminant >= 0) {
    root1 <- (-b + sqrt(discriminant)) / (2*a)
    root2 <- (-b - sqrt(discriminant)) / (2*a)
    return(c(root1, root2))
  } else {
    return(NA)  # No real roots
  }
}
roots <- solution(a, b, f)
print(roots)
```

```
[1] -1 -2
```

```r
# Function to calculate f(x) = ax^2 + bx + f
quadratic_function <- function(x, a, b, f) {
  return(a*x^2 + b*x + f)
}

# Generate x values
x_values <- seq(-2, -1, 0.1)

# Plot the quadratic function
ggplot(data.frame(x = x_values), aes(x, quadratic_function(x, a, b, f))) +
  geom_line(aes(y = quadratic_function(x, a, b, f))) +
  geom_point(alpha = 1) +
  labs(title = "Graphical Representation of Quadratic Equation Solutions") +
  xlab("x") +
  ylab("f(x)")
```


Graphical Representation of Quadratic Equation Solutions
0.00
−0.05
−0.10
−0.15
−0.20
−0.25
f(x)
−2.00
−1.75
−1.50
−1.25
−1.00
x