

is605Assign7

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PS 1.

Please write a function to compute the expected value and standard deviation of an array of values. Compare your results with that of R's mean and std functions. Please document your work in an R-Markdown

le and ensure that you have good comments to help the reader follow yourwork.

```
# Create an array of elements
arr <- c(1,2,5,3,9,4,5,12,15,2)

# Create a function to compute expected value of the array of elements
compute_expected_value <- function(arr){
  sum_arr <- sum(arr)
  print("Sum of Array Elements: ")
  print(sum_arr)
  count_arr <- length(arr)
  print("Count of Array Elements: ")
  print(count_arr)
  expected_val <- sum_arr/count_arr
  print("Expected Value of the Array Elements: ")

  return(expected_val)
}

# Create a function to compute the standard deviation of the array of elements
compute_sd <- function(arr){
  # get same value from compute_expected_value(arr)
  mu <- mean(arr)
  n <- length(arr)
  standarddev <- 0.0
  standarddev <- sqrt(sum((arr - mu)^2) / (n - 1))
  print("Std Dev of Array Elements: ")

  return(standarddev)
}

# Results from built in mean and sd functions

# built in mean is same as my function
mean(arr)

## [1] 5.8

# built in sd is same as my function
sd(arr)

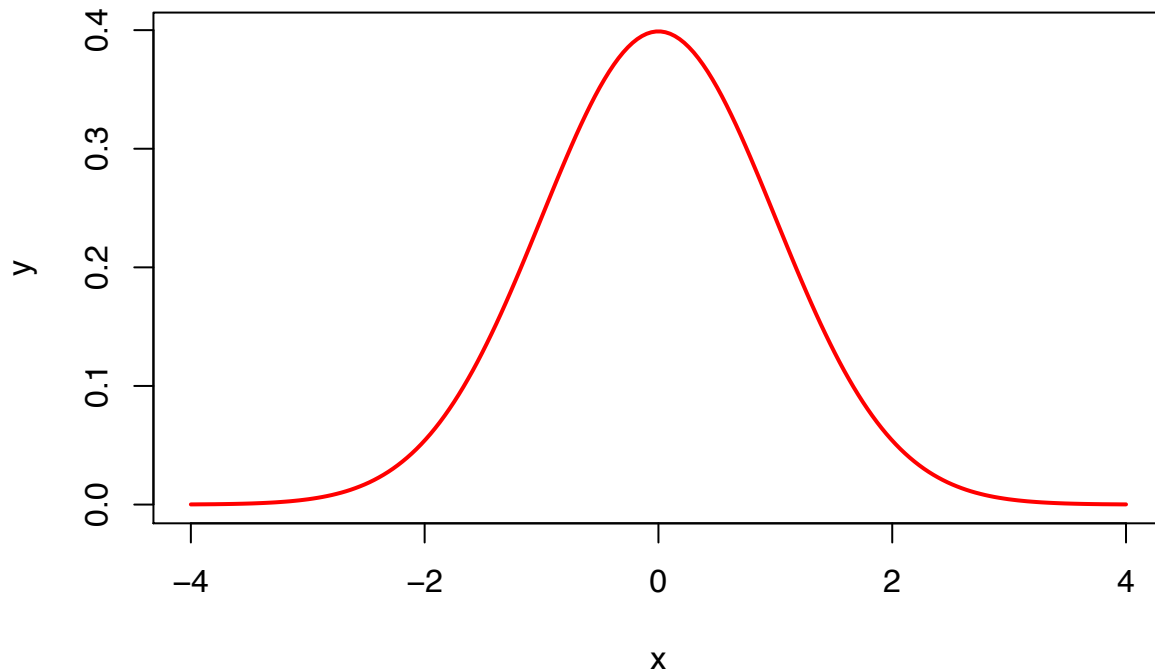
## [1] 4.686
```

PS1 Part 2:

Here we consider an infinite stream of random variables with a Probability Density Function of $f(x)$. We compute the expected value of this random variable as follows:

```
x = seq(-4,4,length = 200)
y = 1/sqrt(2*pi)*exp(-x^2/2)

# plot of pdf of continuous random variable
plot(x,y,type = "l", lwd=2, col = "red")
```

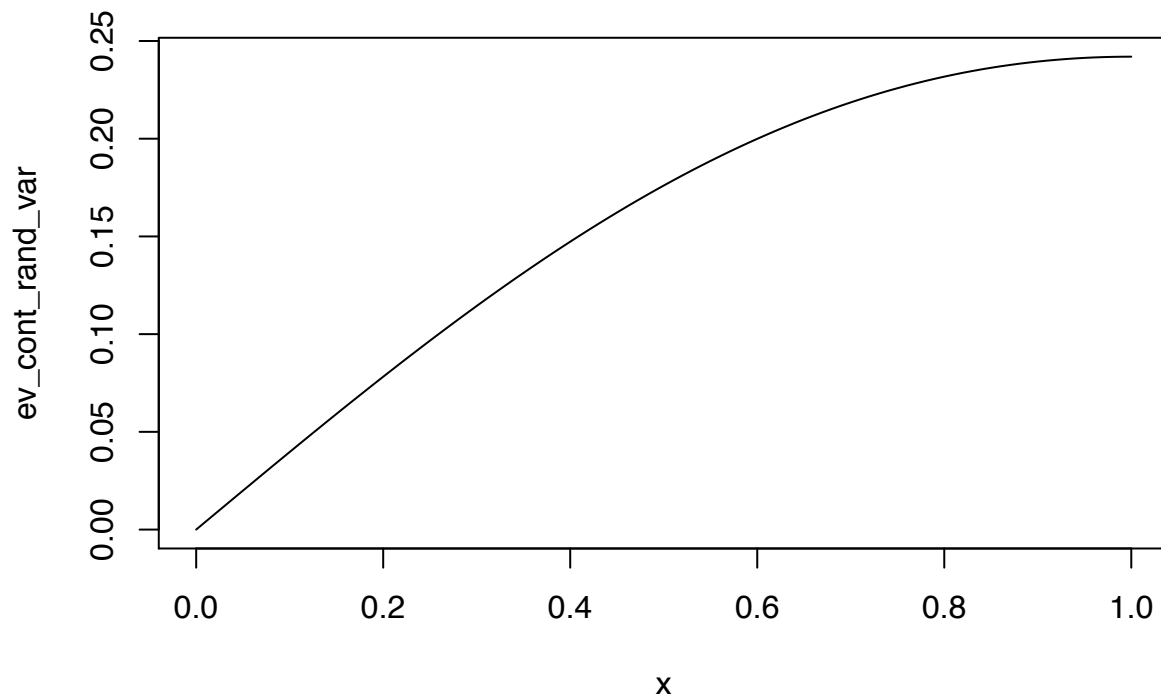


```
# f(x)
f <- function(x){
  return(1/sqrt(2*pi)*exp(-x^2/2))
}

# expected value
ev_cont_rand_var <- function(x){
  return(as.numeric(x*f(x)))
}
integrate(ev_cont_rand_var, -Inf, Inf)
```

```
## 0 with absolute error < 0
```

```
# plot of expected value of continuous random variable
plot(ev_cont_rand_var)
```



```
# standard dev of cont rand variable
stdev_cont_rand_var <- sqrt(ev_cont_rand_var(x))
```

```
## Warning: NaNs produced
```

```
# plot of std dev of cont rand variable
plot(stdev_cont_rand_var)
```

