HW7_567

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```r
prob_a <- pnorm(1) - pnorm(0)
print(prob_a)
```

```
## [1] 0.3413447
```

```r
n <- 100000

Z <- rnorm(n)

indicator <- (Z >= 0) & (Z <= 1)
P_estimate_b <- mean(indicator)
variance_estimate_b <- var(indicator)

cat("Monte Carlo Estimate:", P_estimate_b, "\n")
```

```
## Monte Carlo Estimate: 0.34042
```

```r
cat("Variance Estimate:", variance_estimate_b, "\n")
```

```
## Variance Estimate: 0.2245365
```

```r
n <- 100000

U <- runif(n, 0, 1)

weights <- dnorm(U)
P_estimate_c <- mean(weights)
variance_estimate_c <- var(weights)

cat("Importance Sampling Estimate:", P_estimate_c, "\n")
```

```
## Importance Sampling Estimate: 0.3412449
```

```r
cat("Variance Estimate:", variance_estimate_c, "\n")
```

```
## Variance Estimate: 0.002357041
```