Quiz 3

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```r
p_defective <- 0.04
p_good <- 1 - p_defective

mu_good <- 4.5
sd_good <- 0.2

mu_defective <- 4.2
sd_defective <- 0.2

x <- 4.3

normal_pdf <- function(x, mu, sigma) {
  (1 / (sqrt(2 * pi) * sigma)) * exp(- ((x - mu)^2) / (2 * sigma^2))
}

f_good <- normal_pdf(x, mu_good, sd_good)
f_defective <- normal_pdf(x, mu_defective, sd_defective)

post_good <- f_good * p_good
post_defective <- f_defective * p_defective

prob_good <- post_good / (post_good + post_defective)
prob_defective <- post_defective / (post_good + post_defective)

cat("Posterior probability good:", prob_good, "\n")
```

```
## Posterior probability good: 0.9428406
```

```r
cat("Posterior probability defective:", prob_defective, "\n")
```

```
## Posterior probability defective: 0.05715938
```

```r
if (prob_good > prob_defective) {
  cat("Classify as: GOOD (equal penalty)\n")
} else {
  cat("Classify as: DEFECTIVE (equal penalty)\n")
}
```

```
## Classify as: GOOD (equal penalty)
```

```r
loss_good_defective <- 10
loss_defective_good <- 1

# Adjust decision rule
if (loss_good_defective * prob_defective > loss_defective_good * prob_good) {
```

```
  cat("Classify as: DEFECTIVE (with penalty ratio)\n")
} else {
  cat("Classify as: GOOD (with penalty ratio)\n")
}
```

```
## Classify as: GOOD (with penalty ratio)
```