Error In Book?

Contents

Here is the premise of the problem:

0.1 P(X < 1.4)

We can easily finds the probability that X < 1.4:

```
pnorm(1.4, 1.9, 0.5)
```

```
## [1] 0.1586553
```

0.2 P(X >= 2.4)

To find the odds X is greater than or equal to 2.4 we subtract it from 1:

```
# 1 minus the odds it's less than 2.4
1 - pnorm(2.4, 1.9, 0.5)
```

```
## [1] 0.1586553
```

0.3 P(X > 1.4 & <= 2.4)

What is the probability a number will fall in the middle?

Example 2. Suppose that the expression values of gene CCND3 Cyclin D3 can be represented by X which is distributed as $N(1.90, 0.5^2)$. From the graph of its density function in Figure 3.3, it can be observed that it is symmetric and bell-shaped around $\mu = 1.90$. A density function may very well be seen as a histogram with arbitrarily small bars (intervals). The probability that the expression values are less then 1.4 is

$$P(X < 1.4) = \texttt{pnorm}(1.4, 1.9, 0.5) = 0.1586.$$

Figure 3.4 illustrates the value 0.16 of the distribution function at $x = 1.4$. It corresponds to the area of the blue colored surface below the graph of the density function in Figure 3.3. The probability that the expression values are larger than 2.4 is

$$P(X \geq 2.4) = 1 - \texttt{pnorm}(2.4, 1.9, 0.5) = 0.1586.$$

Figure 1:

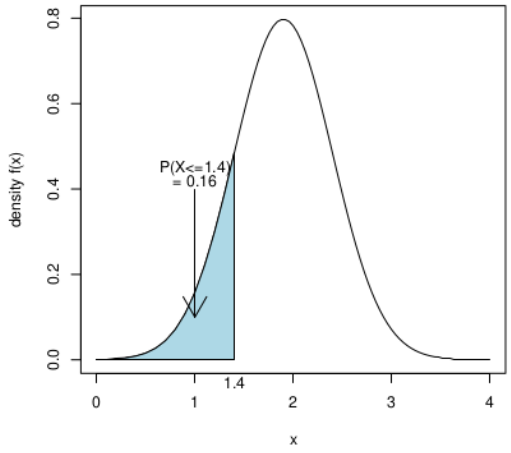

Figure 3.3: Graph of normal density with mean 1.9 and standard deviation 0.5.

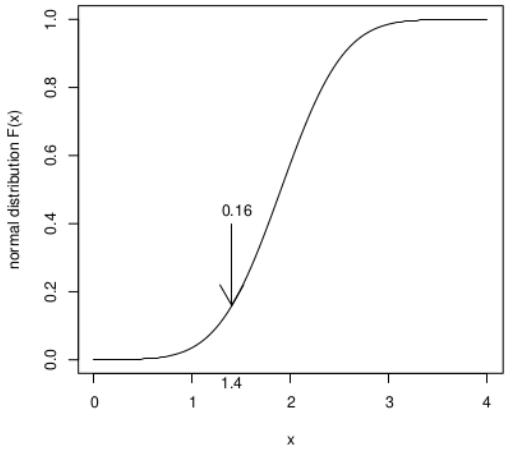

Figure 3.4: Graph of normal distribution with mean 1.9 and standard deviation 0.5.

The probability that X is between 1.4 and 2.4 equals

$$P(1.4 \leq X \leq 2.4) = \texttt{pnorm}(2.4, 1.9, 0.5) - \texttt{pnorm}(1.4, 1.9, 0.5) = 0.9545.$$

According to the book:

The calculation in the book:

```r
# execute answer in the book:
pnorm(2.4, 1.9, 0.5) - pnorm(1.4, 1.9, 0.5)
```

```
## [1] 0.6826895
```

…but the book says 95%. But if there is a 16% chance it's below 1.4 and a 16% chance that it's above 2.4, how can there be a 95% chance it's between the two?

```r
# if we have these odds...
below1.4 <- pnorm(1.4, 1.9, 0.5)

# and these odds...
atOrAbove2.4 <- 1 - pnorm(2.4, 1.9, 0.5)

# doesn't the odds it's in between have to be 1 minus them both?
1 - below1.4 - atOrAbove2.4
```

```
## [1] 0.6826895
```

This is what we get from the calculation in the book, so I suspect the calculation is right but the answer is wrong.

If we include the 95:

```r
0.9545 + below1.4 + atOrAbove2.4
```

```
## [1] 1.271811
```

We can't odds on a scale of 1.27.