

Name: _____

Student ID: _____

Signature: _____

1.

				1	0
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 .

1	7	0
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2. (a)

--

 (b)

--

 (c)

X

 (d)

--

 (e)

--

3. (a)

--

 (b)

X

 (c)

--

 (d)

X

 (e)

--

4.

glm

5. (a) (a)

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 (b)

--

 (c)

X

(b)

				-	0
--	--	--	--	---	---

 .

9	0	6
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6.

		4	7	8	2
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 .

8	3	9
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1. Problem

What is the derivative of $f(x) = x^5 e^{2.3x}$, evaluated at $x = 0.73$?

Solution

Using the product rule for $f(x) = g(x) \cdot h(x)$, where $g(x) := x^5$ and $h(x) := e^{2.3x}$, we obtain

$$\begin{aligned} f'(x) &= [g(x) \cdot h(x)]' = g'(x) \cdot h(x) + g(x) \cdot h'(x) \\ &= 5x^{5-1} \cdot e^{2.3x} + x^5 \cdot e^{2.3x} \cdot 2.3 \\ &= e^{2.3x} \cdot (5x^4 + 2.3x^5) \\ &= e^{2.3x} \cdot x^4 \cdot (5 + 2.3x). \end{aligned}$$

Evaluated at $x = 0.73$, the answer is

$$e^{2.3 \cdot 0.73} \cdot 0.73^4 \cdot (5 + 2.3 \cdot 0.73) = 10.166777.$$

Thus, rounded to two digits we have $f'(0.73) = 10.17$.

2. Problem

What is the seat of the federal authorities in Switzerland (i.e., the de facto capital)?

- (a) St. Gallen
- (b) Basel
- (c) Bern
- (d) Zurich
- (e) Lausanne

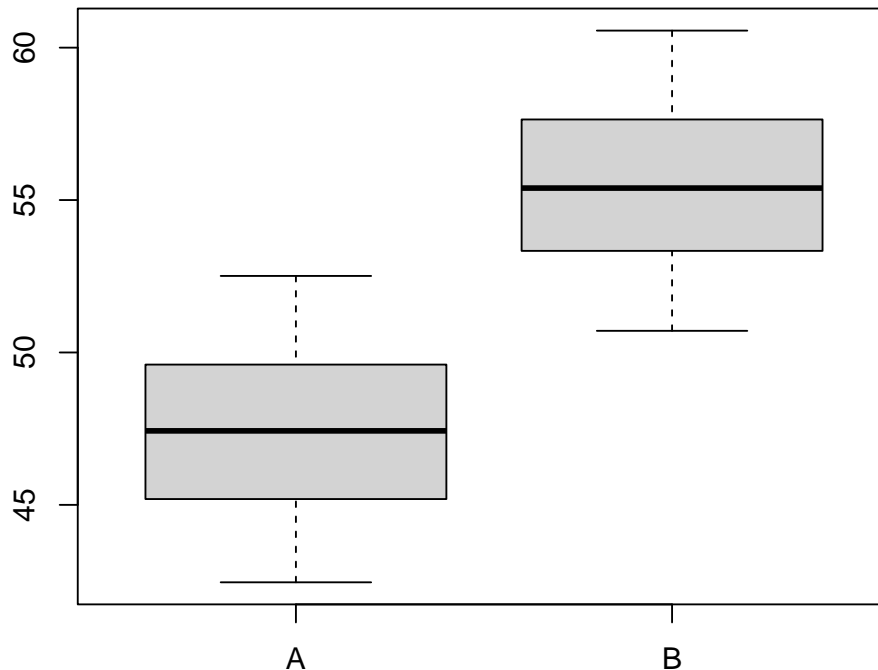
Solution

There is no de jure capital but the de facto capital and seat of the federal authorities is Bern.

- (a) False
- (b) False
- (c) True
- (d) False
- (e) False

3. Problem

In the following figure the distributions of a variable given by two samples (A and B) are represented by parallel boxplots. Which of the following statements are correct? (*Comment: The statements are either about correct or clearly wrong.*)



- (a) The location of both distributions is about the same.
- (b) Both distributions contain no outliers.
- (c) The spread in sample A is clearly bigger than in B.
- (d) The skewness of both samples is similar.
- (e) Distribution A is left-skewed.

Solution

- (a) False. Distribution B has on average higher values than distribution A.
- (b) True. Both distributions have no observations which deviate more than 1.5 times the interquartile range from the box.
- (c) False. The interquartile range in sample A is *not* clearly bigger than in B.
- (d) True. The skewness of both distributions is similar, both are about symmetric.
- (e) False. Distribution A is about symmetric.

4. Problem

What is the name of the R function for Poisson regression?

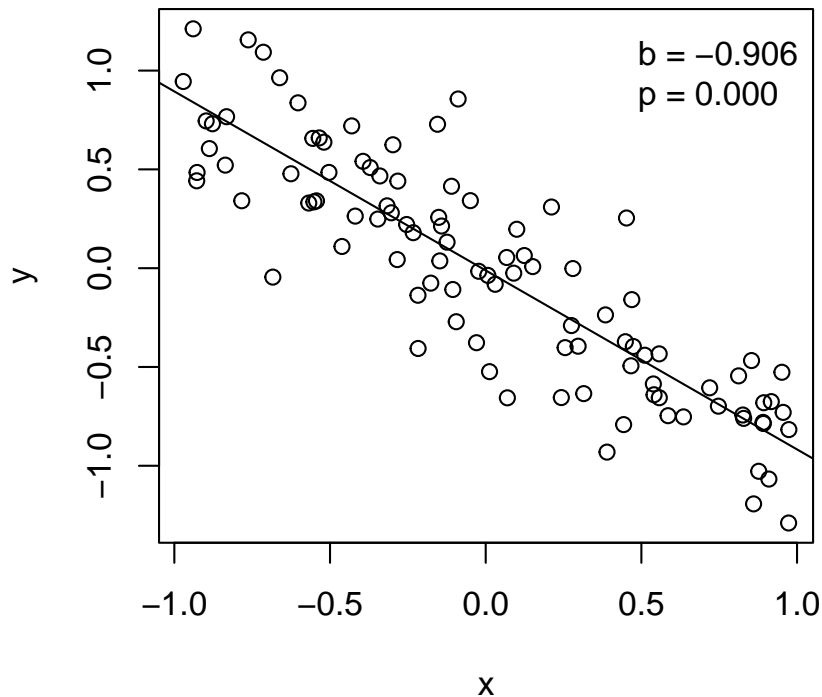
Solution

`glm` is the R function for Poisson regression. See `?glm` for the corresponding manual page.

5. Problem

Using the data provided in `regression.csv` estimate a linear regression of y on x and answer the following questions.

- (a) x and y are not significantly correlated / y increases significantly with x / y decreases significantly with x
- (b) Estimated slope with respect to x :

Solution

To replicate the analysis in R:

```
## data
d <- read.csv("regression.csv")
## regression
m <- lm(y ~ x, data = d)
summary(m)
## visualization
plot(y ~ x, data = d)
abline(m)
```

6. Problem

On 2013-05-03 one Euro (€) was buying 1.3109 US Dollars (\$) and 0.8431 British Pounds (£). At Frankfurter Börse around noon adidas AG was the largest winner compared with the day before with a price of € 84.8492 per share. If you buy 43 shares, how much are they worth in \$?

Solution

The worth in \$ is the number of shares \times stock price \times exchange rate, i.e., $43 \times 84.8492 \times 1.3109 \approx 4782.839$.