

Penugasan Praktikum 1

I.G.N. Ari Sadewa(222313127)

2025-09-02

1.5. Penugasan

1.5.1 Set A - Operasional (dari praktikum)

soal 1(vektor)

diberikan :

```
p <- c(10, 12, 5, 8)
q <- c(7, 4, 9, 11)
```

Hitung :

a). $p + q$

```
p+q
```

```
## [1] 17 16 14 19
```

b). $p - q$

```
p - q
```

```
## [1] 3 8 -4 -3
```

c). $3 * p$

```
3*p
```

```
## [1] 30 36 15 24
```

d). $p \%*\% q$

```
p %*% q
```

```
##      [,1]
```

```
## [1,] 251
```

e). $\|p\|$ (norm p)

```
sqrt(sum(p^2))
```

```
## [1] 18.24829
```

soal 2(Matriks)

diberikan :

```
X <- matrix(c(4,1,7, 5,2,6), nrow=2, byrow=TRUE)
Y <- matrix(c(1,5,2, 8,3,0), nrow=3, byrow=FALSE)
X;Y
```

```
##      [,1] [,2] [,3]
```

```
## [1,]    4    1    7
```

```
## [2,]    5    2    6
```

```

##      [,1] [,2]
## [1,]    1    8
## [2,]    5    3
## [3,]    2    0

a) Dimensi X & Y
paste("Dimensi X = ",dim(X)[1],"x",dim(X)[2]); paste("Dimensi Y = ",dim(Y)[1],"x",dim(Y)[2])

## [1] "Dimensi X = 2 x 3"
## [1] "Dimensi Y = 3 x 2"

b) Transpos Y menjadi Y_t
t(Y) #transpose Y

##      [,1] [,2] [,3]
## [1,]    1    5    2
## [2,]    8    3    0

c) X %*% Y
X %*% Y

##      [,1] [,2]
## [1,]   23   35
## [2,]   27   46

d) Apakah X + Y terdefinisi? Jelaskan.
X;Y
```

```

##      [,1] [,2] [,3]
## [1,]    4    1    7
## [2,]    5    2    6

##      [,1] [,2]
## [1,]    1    8
## [2,]    5    3
## [3,]    2    0
```

X + Y tidak terdefinisi karena syarat untuk melakukan penjumlahan matriks adalah kedua matriks harus memiliki dimensi yang sama. Dimensi X adalah 2x3, sedangkan dimensi Y adalah 3x2, sehingga mereka tidak dapat dijumlahkan.

1.5.2 Set B — Konseptual/Geometris (dari PDF)

soal 3(Matriks Ortogonal)

Periksa Apakah :

$$Q = \begin{vmatrix} 5/13 & 12/13 \\ -12/13 & 5/13 \end{vmatrix}$$

adalah ortogonal ($Q'Q=I$). Tunjukkan perhitungan manual & verifikasi R

```

Q <- matrix(c(5/13,12/13, -12/13,5/13), nrow=2, byrow=TRUE)

#Manual
I <- matrix(0, nrow = 2, ncol = 2)
I[1,1] <- t(Q)[1,1]*Q[1,1] + t(Q)[1,2]*Q[2,1]
I[1,2] <- t(Q)[1,1]*Q[1,2] + t(Q)[1,2]*Q[2,2]
I[2,1] <- t(Q)[2,1]*Q[1,1] + t(Q)[2,2]*Q[2,1]
```

```

I[2,2] <- t(Q)[2,1]*Q[1,2] + t(Q)[2,2]*Q[2,2]
I

## [,1] [,2]
## [1,] 1 0
## [2,] 0 1

#Verifikasi R
crossprod(Q,Q)

## [,1] [,2]
## [1,] 1 0
## [2,] 0 1

#Terbukti bahwa Q adalah matriks ortogonal karena Q'Q = I

```

Soal 4 (Johnson & Wichern, Lat. 3.1)

Diberikan

```

x <- c(4, 1, 3)
y <- c(-1, 3, 1)

```

Tentukan:

a) $\|x\|$

```
sqrt(sum(x^2))
```

```
## [1] 5.09902
```

b) sudut $\theta(x, y)$

```

norm_X <- sqrt(sum(x^2))
norm_y <- sqrt(sum(y^2))

```

```

cos_theta <- sum(x * y) / (norm_X * norm_y)
theta <- acos(cos_theta) * (180 / pi)
theta

```

```
## [1] 83.20816
```

c) proyeksi y pada x.

```

proyeksi_y_pada_x <- as.numeric((x %*% y)/(x %*% x))*x
proyeksi_y_pada_x

```

```
## [1] 0.30769231 0.07692308 0.23076923
```

Soal 5 (Johnson & Wichern, Lat. 3.4)

Buktikan:

a) $(A')^{-1} = (A^{-1})'$

Jawaban:

$$\begin{aligned}
 (A')^{-1} &= I' \cdot (A')^{-1} \\
 &= (A \cdot A^{-1})' \cdot (A')^{-1} \\
 &= (A^{-1})' \cdot A' \cdot (A')^{-1} \\
 &= (A^{-1})' \cdot I \\
 &= (A^{-1})'
 \end{aligned}$$

$$\text{b)} \quad (AB)^{-1} = B^{-1}A^{-1}$$

Jawaban:

$$\begin{aligned}(AB)^{-1}(AB) &= (B^{-1}A^{-1})(AB) \\ &= I \quad (\text{definisi invers})\end{aligned}$$

$$\begin{aligned}(B^{-1}A^{-1})(AB) &= B^{-1}(A^{-1}A)B \quad (\text{asosiasi}) \\ &= B^{-1}IB \\ &= B^{-1}B \\ &= I\end{aligned}$$

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