MIS Homework 1

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Problem 1.8

Solution: The total profit is $\sum_i p_i s_i = p^\top s$.

Problem 1.11

a

Solution: $1^\top w$ is total counts of words in the document.

b

Solution: $w_{282} = 0$ means that No.282 word is null.

c

Solution: $h = w/1^\top w$.

Problem 1.19

a

Solution: The prediction is $\widehat{z}_{t+1} \approx z_t$, which means the prediction of tomorrow's value is approximately equal to today's value.

b

Solution: The prediction is $\widehat{z}_{t+1} \approx z_t + (z_t - z_{t-1})$, which means the prediction of tomorrow's value is made by the difference between today's value and yesterday's value.

c

Solution: The prediction is $\widehat{z}_{t+1} \approx z_{t-6}$, which means the prediction of tomorrow's value is approximately equal to the value one week ago.

d

Solution: The prediction is $\widehat{z}_{t+1} \approx 0.5(z_t + z_{t-1})$, which means the prediction of tomorrow's value is made by the the average of today's value and yesterday's value.

Problem A1.2

a

```
x=rand(10)
a=zeros(10)
a[5]=1
import LinearAlgebra.dot
println(dot(a,x))
```

b

```
x=rand(3)
a=[0.3;0.4;0.3]
import LinearAlgebra.dot
println(dot(a,x))
```

c

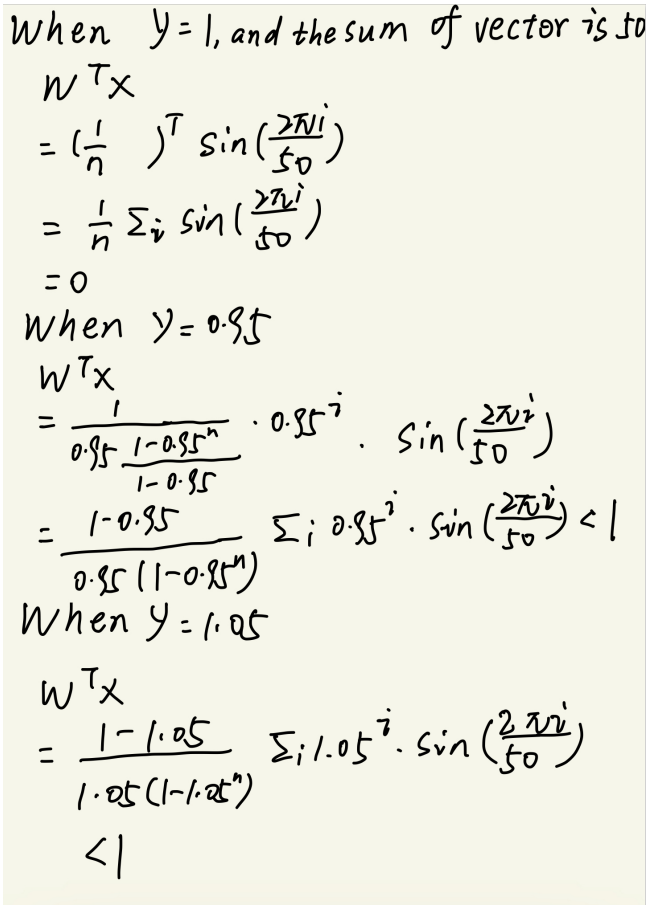
```
x=rand(22)
a=zeros(22)
for i in 1:22
    if i%4==0
    a[i]=1
    elseif i%7==0
    a[i]=-1
    end
end
import LinearAlgebra.dot
println(dot(a,x))
```

d

```
x = rand(11)
a = zeros(11)
a[4:8] = ones(5)
import LinearAlgebra.dot
y=dot(a,x)/5
println(y)
```

Problem A1.10

Solution:



The results are inconsistent with the interpretation given above, for $\gamma = 0.95, \gamma = 1.05$, their parameter values both less than 1.

Problem 2.4

Solution: The answer is ϕcannot be linear, because the value of second point is equal to the third point, if ϕ can be linear, the two values should be negative.

Problem 2.8

Solution:

(a) The intergal is

$$\int_{\alpha}^{\beta} p(x)\,dx = C_1(\beta-\alpha) + \frac{C_2}{2}(\beta^2-\alpha^2) + \frac{C_3}{3}(\beta^3-\alpha^3) + \cdots + \frac{C_n}{n}(\beta^n-\alpha^n)$$

$$a = (\beta-\alpha, \frac{\beta^2-\alpha^2}{2}, \frac{\beta^3-\alpha^3}{3}, \cdots, \frac{\beta^n-\alpha^n}{n})$$

(b) The derivative is

$$p'(\alpha) = C_2 + 2C_3\alpha + 3C_4\alpha^2 + \cdots + C_n(n-1)\alpha^{n-2}$$

$$b = (0, 1, 2\alpha, 3\alpha^2, \cdots (n-1)\alpha^{n-2})$$