**1. Question 1**

Determine if the geometric series is convergent or divergent, and find the sum of the series if it is convergent.

−3+32−34+38−...-3+\frac{3}{2}-\frac{3}{4}+\frac{3}{8}-...−3+23​−43​+83​−...



**It is convergent, and the sum is −2-2−2.**



It is divergent.



It is convergent, and the sum is 12\frac{1}{2}21​.

Question 2

1

Point

**2. Question 2**

Express the rational function as a geometric series: 41+x\frac{4}{1+x}1+x4​



**4−4x+4x2−4x3+4x4−...4-4x+4x^2-4x^3+4x^4-...4−4x+4x2−4x3+4x4−...**

****

**4(1−x+x2−x3+...)4(1-x+x^2-x^3+...)4(1−x+x2−x3+...)**

****

**4∑n=1n=∞(−1)n−1xn−14\sum\_{n=1}^{n=\infty} (-1)^{n-1} x^{n-1}4∑n=1n=∞​(−1)n−1xn−1**

Question 3

1

Point

**3. Question 3**

Express the following model by utilizing Backward shift operator.

Xt=0.5Xt−1+Zt+0.7Zt−1X\_t=0.5 X\_{t-1}+Z\_t+0.7 Z\_{t-1}Xt​=0.5Xt−1​+Zt​+0.7Zt−1​



(1+0.5B)Xt=(1−0.7B)Zt(1+0.5B)X\_t=(1-0.7B)Z\_t(1+0.5B)Xt​=(1−0.7B)Zt​



**(1−0.5B)Xt=Zt+0.7Zt−1(1-0.5B)X\_t=Z\_t+0.7Z\_{t-1}(1−0.5B)Xt​=Zt​+0.7Zt−1​**

****

**(1−0.5B)Xt=(1+0.7B)Zt(1-0.5B)X\_t=(1+0.7B)Z\_t(1−0.5B)Xt​=(1+0.7B)Zt​**

Question 4

1

Point

**4. Question 4**

We write the model Xt=Xt−1+2Xt−2+ZtX\_t=X\_{t-1}+2X\_{t-2}+Z\_tXt​=Xt−1​+2Xt−2​+Zt​ as ϕ(B)Xt=Zt\phi(B)X\_t=Z\_tϕ(B)Xt​=Zt​. What is ϕ(B)\phi(B)ϕ(B)?



ϕ(B)=(1−B)(1+2B)\phi(B)=(1-B)(1+2B)ϕ(B)=(1−B)(1+2B).



**ϕ(B)=(1+B)(1−2B)\phi(B)=(1+B)(1-2B)ϕ(B)=(1+B)(1−2B).**

****

**ϕ(B)=1−B−2B2\phi(B)=1-B-2B^2ϕ(B)=1−B−2B2.**

Question 5

1

Point

**5. Question 5**

Is the following process invertible?

Xt=Zt+3Zt−1X\_t=Z\_t+3Z\_{t-1}Xt​=Zt​+3Zt−1​



It is an invertible process since the coefficient 333 is larger than 111.



**It is not an invertible process.**

Question 6

1

Point

**6. Question 6**

For what values of the θ\thetaθ, the process Xt=Zt−θZt−1−6θ2Zt−2X\_t=Z\_t-\theta Z\_{t-1}-6\theta^2 Z\_{t-2}Xt​=Zt​−θZt−1​−6θ2Zt−2​ is an invertible process.



**∣θ∣<13|\theta|<\frac{1}{3}∣θ∣<31​**



∣θ∣<12|\theta|<\frac{1}{2}∣θ∣<21​



**~~∣θ∣>13|\theta|>\frac{1}{3}∣θ∣>31​~~**

Question 7

1

Point

**7. Question 7**

Is the AR(2) process Xt=Xt−1+2Xt−2+ZtX\_t=X\_{t-1}+2X\_{t-2}+Z\_tXt​=Xt−1​+2Xt−2​+Zt​ stationary?



**It is not a stationary process.**



It is a stationary process.

Question 8

1

Point

**8. Question 8**

Find all possible values of β\betaβ so that the AR(2) process Xt=2βXt−1−β2Xt−2+ZtX\_t=2\beta X\_{t-1}- \beta^2 X\_{t-2}+Z\_tXt​=2βXt−1​−β2Xt−2​+Zt​is stationary.



∣β∣>1|\beta|>1∣β∣>1



**∣β∣<1|\beta|<1∣β∣<1**



∣β∣=1|\beta|=1∣β∣=1

Question 9

1

Point

**9. Question 9**

Determine if the process is stationary, invertible or both: Xt=0.5Xt−1+Zt+4Zt−1X\_t=0.5 X\_{t-1}+Z\_t+4Z\_{t-1}Xt​=0.5Xt−1​+Zt​+4Zt−1​



**~~Stationary but not invertible.~~**



**~~Neither stationary nor invertible.~~**



Invertible but not stationary.



**~~Stationary and invertible.~~**

Question 10

1

Point

**10. Question 10**

Find all values of β\betaβ and θ\thetaθ such that duality exists for the following process, i.e., it is stationary an invertible: Xt=β2Xt−1+Zt+8θ3Zt−1X\_t=\beta^2X\_{t-1}+Z\_t+8\theta^3Z\_{t-1}Xt​=β2Xt−1​+Zt​+8θ3Zt−1​.



∣β∣>1|\beta|>1∣β∣>1 and ∣θ∣>12|\theta|>\frac{1}{2}∣θ∣>21​



**~~∣β∣<1|\beta|<1∣β∣<1 and ∣θ∣>12|\theta|>\frac{1}{2}∣θ∣>21​~~**



**∣β∣<1|\beta|<1∣β∣<1 and ∣θ∣<12|\theta|<\frac{1}{2}∣θ∣<21​**