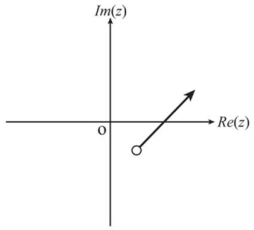
Question 1

QUESTION 10

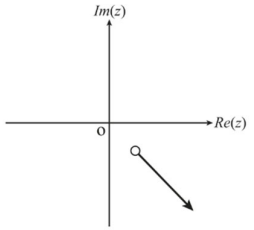
Simple Familiar
Technology Free
2020

The subset of the complex plane that represents $\arg[z+i-1]+\frac{\pi}{4}=0$ for $z \in C$ is

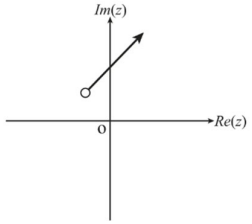
(A)



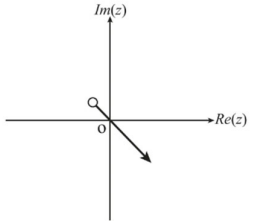
(B)



(C)



(D)



Question 2

QUESTION 8

Simple Familiar
Technology Free
2022

Use the substitution $u=\tan(x)$ to determine $\int \tan(x)\sec^2(x)dx$.

(A) $\frac{1}{2}\tan(x)+c$

(B) $\frac{1}{2}\tan^2(x)+c$

(C) $\tan(x)+c$

(D) $\tan^2(x)+c$

Question 3

QUESTION 4

Simple Familiar
Technology Free
2022

When using proof by mathematical induction to prove De Moivre's theorem expressed as $(r\text{cis}(\theta))^n = r^n\text{cis}(n\theta)\forall n \in Z^+$, which statement would be correct in the proof of the inductive step?

(A) $(r\text{cis}(\theta))^k = r^k\text{cis}(k\theta)$

(B) $(r\text{cis}(\theta))^k = r^{k+1}\text{cis}(k+\theta)$

(C) $(r\text{cis}(\theta))^{k+1} = r^{k+1}\text{cis}(k\theta+1)$

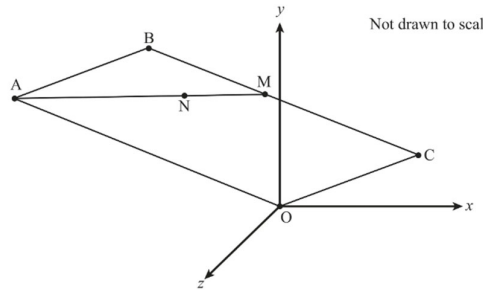
(D) $(r\text{cis}(\theta))^{k+1} = r^{k+1}\text{cis}((k+1)\theta)$

Question 4

QUESTION 15 (6 marks)

Simple Familiar
Technology Free
2020

The points O(0, 0, 0), A(–6, 2, –2) and C(3, 1, 2) are represented in three-dimensional space in the diagram.



OABC forms a parallelogram in three-dimensional space.

a) Determine the coordinates of B. *[1 mark]*

M is the midpoint of BC.

b) Determine the vector that represents $\overrightarrow{OM}$. *[1 mark]*

N divides AM in the ratio 2:1.

c) Determine the vector that represents $\overrightarrow{ON}$. *[2 marks]*

d) Use a vector method to show that O, B and N lie on a straight line. *[2 marks]*

Question 5

QUESTION 19 (7 marks)

Complex Unfamiliar
Technology Free
2021

The velocity vectors of two objects A and B $\left(\text{in m s}^{-1}\right)$ at time t (in s) are given respectively by

$$\boldsymbol{v}_A = 6\sin(3t)\hat{\boldsymbol{i}} + 6\cos(3t)\hat{\boldsymbol{j}}$$
$$\boldsymbol{v}_B = \cos(t)\hat{\boldsymbol{i}} - \sin(t)\hat{\boldsymbol{j}}$$

Objects A and B are initially at $(-2, 0, 2)$ and $(0, 1, -1)$ respectively. Determine the position of Object A when it is 4 metres away from Object B for the first time.