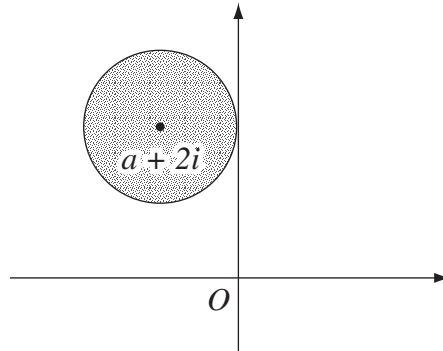


Sample Questions – Mathematics Extension 2

1 Consider the Argand diagram below.



Which inequality could define the shaded area?

- (A) $|z - (a + 2i)| \geq 1$
(B) $|z - (a + 2i)| \leq 1$
(C) $|z + a - 2i| \leq 1$
(D) $|z + a - 2i| \geq 1$
- 2 Which of the following is an expression for $\int xe^{2x} dx$?

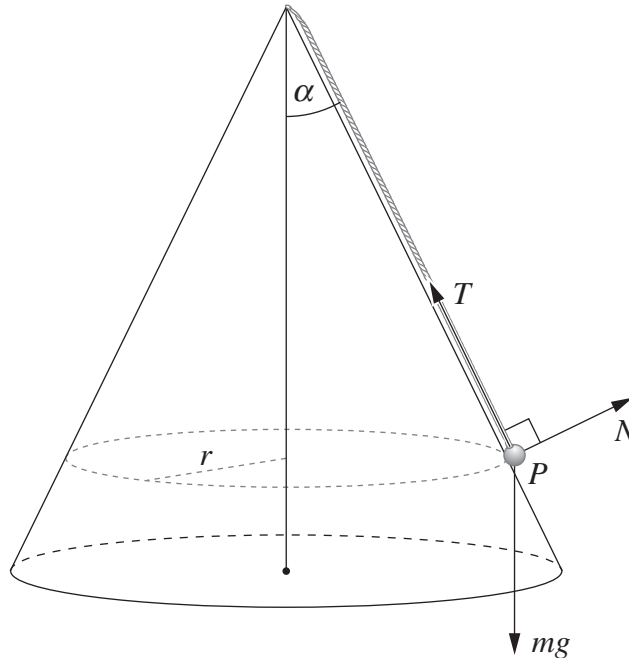
- (A) $e^{2x} \left(\frac{x}{2} - \frac{1}{4} \right) + C$
(B) $e^{2x} \left(\frac{x}{2} - 1 \right) + C$
(C) $e^{2x} \left(x - \frac{1}{4} \right) + C$
(D) $e^{2x} (2x - 1) + C$

3 The polynomial $P(z)$ has real coefficients. The roots of $P(z) = 0$ include $z = 1 - i$ and $z = 2$.

What is the lowest possible degree of $P(z)$?

- (A) One
(B) Two
(C) Three
(D) Four

- 4 A light string is attached to the vertex of a smooth vertical cone. A particle P of mass m is attached to the string as shown in the diagram. The particle remains in contact with the cone and rotates with constant angular velocity ω on a circle of radius r . The string and the surface of the cone make an angle of α with the vertical, as shown.

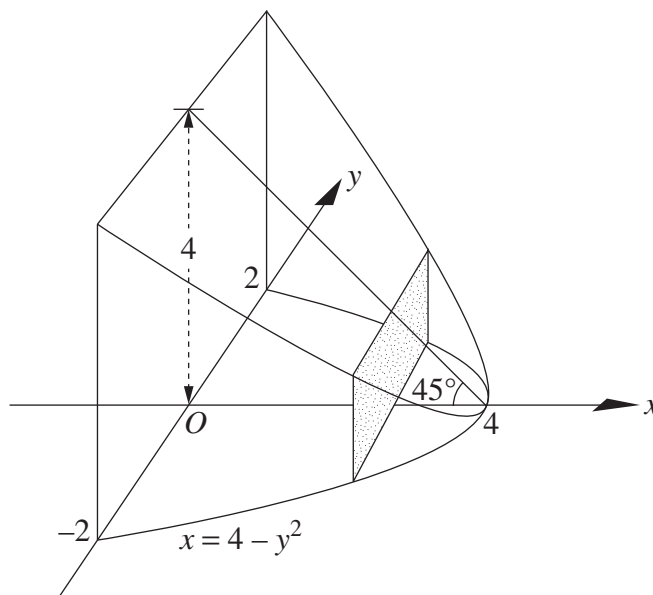


The forces acting on the particle are the tension, T , in the string, the normal reaction, N , to the cone and the gravitational force mg .

Which of the following gives the correct resolution of forces on P in the horizontal and vertical directions?

- (A) $T \sin \alpha - N \cos \alpha = mr\omega^2$
 $T \cos \alpha + N \sin \alpha = mg$
- (B) $T \sin \alpha - N \cos \alpha = mr\omega^2$
 $T \sin \alpha + N \cos \alpha = mg$
- (C) $T \sin \alpha + mr\omega^2 = N \cos \alpha$
 $T \cos \alpha + N \sin \alpha = mg$
- (D) $T \sin \alpha - N \sin \alpha = mr\omega^2$
 $T \cos \alpha + N \sin \alpha = mg$

- 5 The base of a solid is the region enclosed by the parabola $x = 4 - y^2$ and the y -axis. The top of the solid is formed by a plane inclined at 45° to the xy -plane. Each vertical cross-section of the solid parallel to the y -axis is a rectangle. A typical cross-section is shown shaded in the diagram.



Which of the following expressions gives a correct representation of the volume of the solid, V ?

- (A) $V = \int_0^4 x\sqrt{4-x} \, dx$
- (B) $V = 2 \int_0^4 x\sqrt{4-x} \, dx$
- (C) $V = \int_0^4 (4-x)\sqrt{4-x} \, dx$
- (D) $V = 2 \int_0^4 (4-x)\sqrt{4-x} \, dx$