

The Further Mathematics Support Programme

Mathematical Interview Questions

1. Discuss the integral $\int_{-1}^1 \frac{1}{x^2} dx$.
2. Prove by contradiction that when $z^2 = x^2 + y^2$ has whole number solutions that x and y cannot both be odd.
3. What is the square root of i ?
4. Sketch the graph $y = \frac{x^4 - 7x^2 + 12}{x^4 - 4x^2 + 4}$.
5. Show that, if n is an integer, $n^3 - n$ is divisible by 6.
6. Find $\int_0^{\infty} x e^{-x^2} dx$ and $\int_0^{\infty} x^3 e^{-x^2} dx$.
7. Find the values of θ if: (a) $e^{i\theta} = i$ (b) $e^{i\theta} = -1$
8. Differentiate x^x
9. Find $\int \cos^2 x dx$ and $\int \cos^3 x dx$
10. Prove that $\sqrt{2}$ is irrational.
11. Draw the graph $y = x \ln x$
12. Why is the derivative of x^2 equal to $2x$?
13. What is the most beautiful proof in mathematics?
14. Differentiate $y = \sin^{-1} x$
15. Is $0.\dot{9}$ less than 1, equal to 1, or greater than 1?
16. How many solutions does the equation $x^3 = -1$ have?
17. If $a^x = b^y = (ab)^{xy}$ show that $x + y = 1$
18. Find the co-ordinates and nature of the turning point on the curve $y = \frac{\ln x}{x}$