

1. Further Pure Mathematics 1

Starter Quiz · 课前小测

A-Level Further Mathematics

Name: _____ Score: _____

1. For $x^2 - 5x + 6 = 0$, what is the sum of the roots $\alpha + \beta = -b/a$?

2. A rational function has an oblique (slant) asymptote when the degree of the top is:

- ☐ higher than the degree of the bottom
- ☐ lower than the bottom
- ☐ equal to the bottom
- ☐ always zero

3. Using $\Sigma r = \frac{1}{2}n(n+1)$, what is the sum of the first 5 integers?

4. What is the determinant of the matrix $\begin{bmatrix} 3 & 1 \\ 2 & 4 \end{bmatrix}$ ($ad - bc$)?

5. In polar coordinates, the x-coordinate is given by:

- ☐ $r \cos \theta$
- ☐ $r \sin \theta$
- ☐ $r \tan \theta$
- ☐ r / θ

6. The vector product $\mathbf{a} \times \mathbf{b}$ gives a vector that is:

- ☐ perpendicular to both $\mathbf{a}$ and $\mathbf{b}$
- ☐ parallel to $\mathbf{a}$
- ☐ equal to $\mathbf{a} + \mathbf{b}$
- ☐ a scalar

7. The two steps of proof by induction are the base case and the:

- ☐ inductive step (assume $n = k$, prove $n = k + 1$)
- ☐ final check at $n = 100$
- ☐ differentiation step
- ☐ substitution

8. For $x^2 - 5x + 6 = 0$, what is the product $\alpha\beta = c/a$?

9. You find an oblique asymptote by:

- ☐ dividing the top polynomial by the bottom
- ☐ differentiating
- ☐ setting $x = 0$
- ☐ taking the modulus

10. Using $\Sigma r^2 = (1/6)n(n+1)(2n+1)$, what is the sum of the first 3 squares?

1. **5**

$\alpha + \beta = -b/a = -(-5)/1 = 5.$

2. **higher than the degree of the bottom**

When the numerator’s degree exceeds the denominator’s, dividing out leaves a slant line the curve approaches.

3. **15**

$\frac{1}{2} \times 5 \times 6 = 15 \text{ } (= 1+2+3+4+5).$

4. **10**

$\det = 3 \times 4 - 1 \times 2 = 12 - 2 = 10.$

5. **$r \cos \theta$**

$x = r \cos \theta \text{ and } y = r \sin \theta.$

6. **perpendicular to both a and b**

$a \times b$ is perpendicular to both vectors; its length is $|a||b|\sin \theta.$

7. **inductive step (assume $n = k$, prove $n = k + 1$)**

Induction needs a base case plus an inductive step from k to $k+1$.

8. **6**

$\alpha\beta = c/a = 6/1 = 6.$

9. **dividing the top polynomial by the bottom**

Polynomial division gives the straight-line part the curve approaches far from the origin.

10. **14**

$(1/6)(3)(4)(7) = 84/6 = 14 \text{ } (= 1+4+9).$