2. Further Pure Mathematics 2

Starter Quiz · 课前小测

A-Level Further Mathematics Name: ____________ Score: ______

1. Using cosh x = $(e^x + e^{-x})/2$, what is cosh 0?

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2. The matrix [[2,1],[1,2]] has characteristic equation $(2-\lambda)^2 - 1 = 0$, giving $\lambda = 1$ or $\lambda = 3$. What is the larger eigenvalue?

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3. The derivative of sinh x is:

   ☐ cosh x

   ☐ −cosh x

   ☐ sinh x

   ☐ tanh x

4. What is $\int 1/(a^2 + x^2)\,dx$?

   ☐ $(1/a)\tan^{-1}(x/a) + C$

   ☐ $\sin^{-1}(x/a) + C$

   ☐ $\ln(a^2 + x^2) + C$

   ☐ $a\tan^{-1}(ax) + C$

5. De Moivre's theorem states $(\cos\theta + i\sin\theta)^n$ equals:

   ☐ $\cos n\theta + i\sin n\theta$

   ☐ $n(\cos\theta + i\sin\theta)$

   ☐ $\cos\theta^n + i\sin\theta^n$

   ☐ $\cos(\theta/n) + i\sin(\theta/n)$

6. For dy/dx + 2y = e^x, the integrating factor μ = e^(∫2 dx) is:

   ☐ e^(2x)

   ☐ e^x

   ☐ 2x

   ☐ e^(x^2)

7. For any x, what does $\cosh^2 x - \sinh^2 x$ equal?

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8. The eigenvalues of a matrix A are found by solving:

   ☐ $\det(A - \lambda I) = 0$

   ☐ $A = 0$

   ☐ $\det(A) = 1$

   ☐ $Av = 0$

9. The derivative of $\tan^{-1}x$ is $1/(1+x^2)$. What is its value at x = 0?

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10. How many distinct roots of unity does the equation $z^5 = 1$ have?

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A-Level Further Mathematics

1. **1**

   $\cosh 0 = (e^0 + e^0)/2 = (1 + 1)/2 = 1$.

2. **3**

   $(2-\lambda)^2 = 1 \rightarrow 2-\lambda = \pm 1 \rightarrow \lambda = 1$ or 3; the larger is 3.

3. **cosh x**

   d/dx(sinh x) = cosh x (and d/dx(cosh x) = sinh x).

4. **(1/a) $\tan^{-1}$(x/a) + C**

   This is the standard inverse-tangent integral.

5. **cos nθ + i sin nθ**

   Raising to the power n multiplies the argument by n: cos nθ + i sin nθ.

6. **e^(2x)**

   $\int$2 dx = 2x, so μ = e^(2x).

7. **1**

   The hyperbolic identity is $\cosh^2 x - \sinh^2 x = 1$.

8. **det(A − λI) = 0**

   The characteristic equation det(A − λI) = 0 gives the eigenvalues.

9. **1**

   $1/(1+0^2) = 1$.

10. **5**

    $z^n = 1$ has exactly n roots, equally spaced on the unit circle; here n = 5.