

A-Level Mathematics

Name: _____ Score: _____

1. Writing $(x+4)/((x+1)(x-2)) = A/(x+1) + B/(x-2)$, substitute $x = 2$ to find B.

2. Using $\sec^2\theta \equiv 1 + \tan^2\theta$, if $\tan \theta = 3$, what is $\sec^2\theta$?

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

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

☐ $\ln(x^2+1) + C$

☐ $2 \ln(x) + C$

☐ $x^2+1 + C$

☐ $\tan^{-1}x + C$

5. What is the magnitude of the vector $i + 2j + 2k$?

6. To solve a separable first-order differential equation, you:

☐ put all y terms on one side and all x terms on the other, then integrate both sides

☐ differentiate both sides

☐ square both sides

☐ use partial fractions only

7. What is the modulus of the complex number $3 + 4i$?

8. The binomial expansion $(1+x)^n$ for a fractional or negative n is valid only when:

☐ $|x| < 1$

☐ $x > 1$

☐ $x = 0$

☐ n is positive

9. The integration-by-parts formula is $\int u \, dv =$:

☐ $uv - \int v \, du$

☐ $uv + \int v \, du$

☐ $u \, du - v \, dv$

☐ $\int u \, du \times \int v \, dv$

10. An initial condition is used to:

☐ find the constant, giving the particular solution

☐ remove the derivative

☐ make the equation linear

☐ check the units

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1. **2**

At $x = 2$: $2 + 4 = B(2 + 1)$, so $6 = 3B$, giving $B = 2$.

2. **10**

$$\sec^2 \theta = 1 + 3^2 = 1 + 9 = 10.$$

3. **0.5**

$$1/(1 + 1^2) = 1/2 = 0.5.$$

4. **$\ln(x^2+1) + C$**

The top is the derivative of the bottom (k f'/f form), so the integral is $\ln(x^2+1) + C$.

5. **3**

$$|v| = \sqrt{(1^2 + 2^2 + 2^2)} = \sqrt{(1+4+4)} = \sqrt{9} = 3.$$

6. **put all y terms on one side and all x terms on the other, then integrate both sides**

Separate the variables, then integrate each side.

7. **5**

$$|z| = \sqrt{(3^2 + 4^2)} = \sqrt{(9 + 16)} = \sqrt{25} = 5.$$

8. **$|x| < 1$**

For non-positive-integer powers the series converges only for $|x| < 1$.

9. **$uv - \int v \, du$**

Integration by parts: $\int u \, dv = uv - \int v \, du$.

10. **find the constant, giving the particular solution**

A known value fixes the arbitrary constant, turning the general solution into the particular one.