

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:

☐ differentiate both sides

☐ square both sides

☐ use partial fractions only

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

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:

☐ n is positive

☐ $x > 1$

☐ $|x| < 1$

☐ $x = 0$

9. A numerical root is found by a sign change, then repeatedly applying:

☐ $x = a + b$

☐ partial fractions

☐ $x_{n+1} = F(x_n)$

☐ the quadratic formula

10. Pure 3 differentiation still uses the product, quotient and chain rules from Pure 2.

☐ True ☐ False

A-Level Mathematics

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. **$x_{\{n+1\}} = F(x_n)$**

Iteration applies $x_{\{n+1\}} = F(x_n)$ until the values converge to the root.

10. **True**

Those rules carry over; only the inverse-tangent derivative is new.