

AS-Level Mathematics - Pure Maths Test - 'INTERMEDIATE'

1. (a) Factorise $9x^2 - 4y^2$
- (b) Simplify $(4x^2)^{\frac{-3}{2}}$
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- (c) Rationalise the denominator of $\frac{\sqrt{5}-2}{\sqrt{5}+3}$
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2. (a) Show that $x - 2$ is a factor of $f(x) = 2x^3 - 3x^2 - 5x + 6$
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- (b) Factorise $f(x)$ completely
- (c) Sketch $f(x)$.
3. (a) Determine the set of values of k for which the equation $x^2 + 2x - k = 0$ has 2 real solutions.
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- (b) Suppose $k = 2$. By first completing the square, sketch the graph of $y = x^2 + 2x - k$, labelling clearly any intersection of axes and the vertex of the graph.

4. Solve the following simultaneous equations:

$$\begin{aligned} 2y + x - 3 &= 0 \\ x^2 + 3xy - 10 &= 0 \end{aligned}$$

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5. Find the values of x for which $x^2 < 2x + 3$

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6. Sketch the graph of $f(x) = 4x^2 - 4x - x^3$.

7. The line l_1 passes through the points $A(2, 6)$ and $B(0, -1)$. The line l_2 is perpendicular to l_1 and intersects l_1 at the point B .

(a) Find the equation of the line l_1 in the form $ax + by + c = 0$ where a , b and c are integers

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(b) Find the coordinates of the point where l_2 intersects the x -axis

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8. The lines $x = 2$ and $x = 7$ are tangent to a circle and $y = 4$ touches the top of the circle. Find the equation of the circle in the form $(ax + b)^2 + (ay + c)^2 = d$, where a , b , c and d are integers.

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9. If x is so small that x to the power of 3 or higher can be ignored, show that

$$(3 - x)(1 + 2x)^4 \approx 3 + 23x + 64x^2$$

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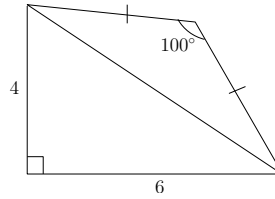
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10. Calculate the area of this quadrilateral:



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11. Triangle PQR is such that $PQ = 3\text{cm}$, $PR = 4\text{cm}$ and angle $QPR = \frac{2}{5}\pi$. An arc of a circle, centre at P and radius 3cm starts at Q and cuts PR at S . Find the perimeter and area of the region enclosed by the arc QS and the sides SR and QR

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12. Without the use of a calculator, evaluate the following:

(a) $\cos(270)$

(b) $\sin\left(\frac{-\pi}{2}\right)$

(c) $\tan(180)$

13. Solve $\cos(4t) = \frac{2}{3}$ on the interval $0 \leq t \leq 360$

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14. Solve $2\log_4(x) - \log_4(2x - 3) = 1$ for x

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15. Find y given that $\frac{dy}{dx} = \frac{1}{\sqrt{x}}$ and y passes through the point $(9, 9)$
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16. Find and classify the stationary points of $y = 2x^3 - 3x^2 - 36x + 14$
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17. Find the equation of the tangent to the curve of $y = x^2(1 - x)$ at the point where $x = 1$
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18. (a) Find the x -coordinates of where the graphs of $y = 3x - x^2$ and $y = 2x$ intersect.
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- (b) Hence, find the area of the region enclosed by the two graphs.....
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