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

1. (a) Factorise $6x^2 + 7x - 3$

   (b) Simplify $(9x^2)^{\frac{3}{2}}$

   (c) Express $2\sqrt{20} + \sqrt{45}$ in the form $a\sqrt{5}$ where a is an integer

2. Find the values of k for which the quadratic equation $(k-1)x^2 + 3kx + k - 1$ has a single repeated root.

3. Find the set of x values for which $x^2 - 3x < 28$ AND $4x + 3 \geq 0$

4. Sketch the graph of $f(x) = \frac{-1}{x+1}$, labelling any intersections and asymptotes.

5. Simplify the following fractions:

   (a) $\frac{x^2-7x+12}{x-4}$

   (b) $\frac{2x^3+13x^2+16x-15}{x+3}$

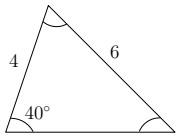
6. Line l_1 passes through the points $(-4, 2)$ and $(-1, -2)$. Find the equation of the line parallel to l_1 that intersects the y-axis at $y = 4$.

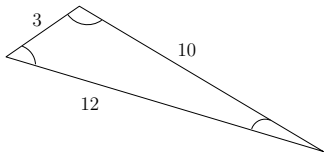
7. Find the equation of the circle whose diameter is the straight line between $(-1, 3)$ and $(4, 3)$.

8. Find the first 3 terms, in ascending powers of x, of the expansion $(2x - y)^5$.

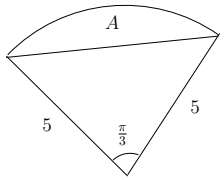
9. Sketch the graph of $\cos(x)$ between $-\pi$ and π.

10. Find the missing angles of these triangles.





11. Find the area of the region marked A:



12. Solve the equation $2\sin^2(\theta) + 3\cos(\theta) = 3$ on the interval $0° \leq \theta \leq 360°$.

13. Find the values of the following logarithms without a calculator:

    (a) $\log_4(64)$

    (b) $\log_3\left(\frac{1}{9}\right)$

    (c) $\log_8(1)$

14. Given that $y = \frac{1-2x^3}{x^2}$,

    (a) Find $\frac{dy}{dx}$

    (b) Find $\frac{d^2y}{dx^2}$

15. On what interval is the function $x^2 + 4x - 1$ a decreasing function?

16. Find the following integrals:

    (a) $\int x^{-3} dx$. . . . . .

    (b) $\int \left(5x^{\frac{3}{4}} - 2\right) dx$. . . . . .

    (c) $\int \frac{1}{\sqrt{x}} dx$. . . . . .

17. Evaluate $\int_1^2 3x \, dx$. . . . . .