TEST PAPER G

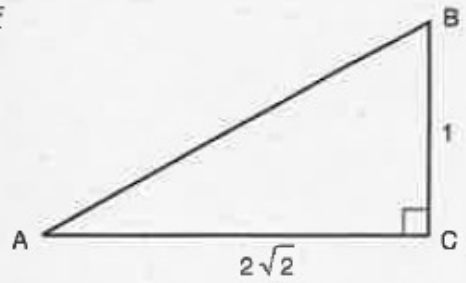
1. Find the value of $(5 + 2\sqrt{3})^2$.

2. In how many places does the graph of $f: x \to \cos 4x$ cross the x-axis, $0 \le x \le 180$?
   Draw a rough sketch to illustrate your answer.

3. If the points A(2, 1), B(a, 5) and C(b, –7) are collinear, show that $2a + b = 6$.

4. A circle has equation $x^2 + y^2 - 8x + 6y + 21 = 0$. Find the equation of the circle under reflection in the line $y = -x$.

5. In a right-angled triangle, $\tan A = \frac{1}{2\sqrt{2}}$, find the exact value of
   cos 2A and sin 2A.



6. A sequence is defined by the recurrence relation $u_{n+1} = 4u_n - 5$.
   (a) Express u_{n+2} in terms of u_n.
   (b) If $u_{n+3} = 87$, find the value of u_n.
   (c) Find u_{n-1} and u_{n+4}.

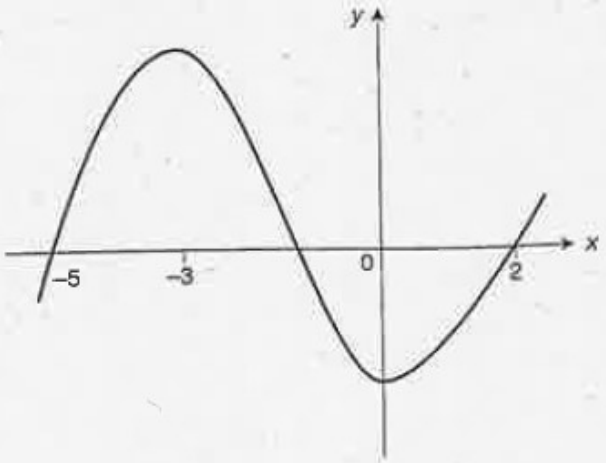
7. When $f(x) = (3x^2 - 2x)^4$, find $f'(x)$ and $f'(-1)$.

8. $D = 2\cos\left(x - \frac{\pi}{2}\right), \qquad 0 \le x \le 2\pi$

   Find the maximum and minimum values of D and the values of x at these points.

9. The diagram shows the sketch of $f(x)$.

Make a rough sketch of $f'(x)$.



10. *(a)* A is the point $(2, -2, 5)$, B is the point $(-2, 2, -3)$, P divides AB in the ratio 1 : 3. Find the coordinates of P.

(b) State the ratio AB : PB.

11. Given $f'(x) = 3x^2 - 4x + 5$ and the point $(-2, 6)$ lies on $f(x)$, find $f(3)$.

12. A triangle has coordinates $(2, 5)$, $(4, 1)$ and $(8, -3)$ respectively. Find the coordinates of the centroid of the triangle.