TEST PAPER A

1. In how many places does the graph of $f: x \to \cos 3x$ cross the x-axis, $0 \leq x < 360$?

Draw a rough sketch to illustrate your answer.

2. In a right angled triangle $\tan A = \frac{5}{3}$.

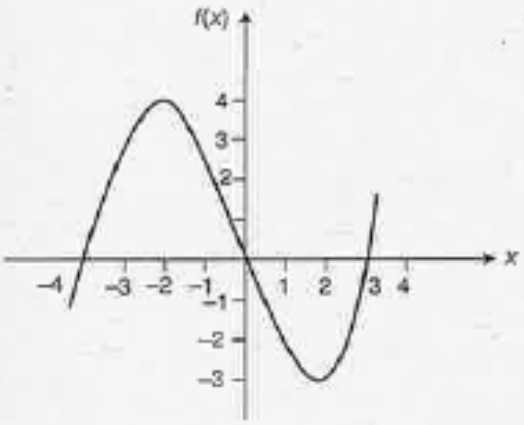
find

(a) the exact value of $\cos 2A$

(b) and show that $\cos 2A + \sin 2A = \frac{7}{17}$.

3. A circle with equation $x^2 + y^2 - 8x + 11 = 0$ touches another circle at the point $(6, 1)$. Find the equation of this second circle if its radius is twice as long.

4. In the graph shown, for what values of x are the statements $f(x) > 0$ and $f'(x) < 0$ both true.



5. *(a)* Using the method of completing the square find the minimum value of $y = x^2 - 6x + 4$.

(b) Make a rough sketch of the curve showing the turning point and any axis intercepts.

(c) From your sketch state the nature of the roots of the equation giving an explanation.

6. $f(x) = x^2 - 3$ and $g(x) = 2x + 1$

(a) Find $f(g(x))$ and $g(f(x))$.

(b) If $f(g(x)) - g(f(x)) = 9$, find the possible values of x.

7. A sequence is defined by the recurrence relation $u_{n+1} = 2u_n + 3$

(a) Express u_{n+2} in terms of u_n.

(b) If $u_{n+3} = 53$, find the value of u_n.

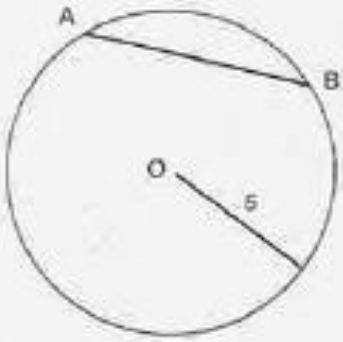
(c) Find u_{n-1} and u_{n+4}, using the value of u_n from *(b)*.

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

9. If $\int_a^3 (3x^2 - 2x)dx = 20$, find a.

10. A chord AB is 3 units from the centre of a circle centre O and radius 5.

Find sin $\hat{AOB}$.



11. *(a)* A is the point (3, 1, 4), B is the point (6, 7, 10). P divides AB in the ratio 1 : 2. Find the coordinates of P.

(b) State the ratio of AP : BP.

12. *(a)* Given that $(x + 3)$ is a factor of $f(x) = x^3 + 6x^2 + 5x - 12$, fully factorise $f(x)$.

(b) State the coordinates of the points where $f(x)$ meets the axes.