# TEST PAPER K

1. For what values of $x$ is the function $x^3 - 3x - 5$ decreasing? Make a rough sketch to illustrate your answer.

2. If P and Q are points on the curve $3xy = -2$ with $x$ coordinates 1 and $-1$ respectively, find the gradient of PQ.

3. By expressing $3x$ as $(2x + x)$ and $x$ as $(2x - x)$, find $\cos(3x) + \cos x$.

4. By the method of completing the square, find the minimum value of $2x^2 + x + 2$.

5. If $\dfrac{x - 2y}{3} = \dfrac{y - 2x}{2}$, find the value of $\dfrac{7x - 2y}{3x + y}$.

6. If $f(x) = x^2 - 3$ and $g(x) = 2 - x$, find $f(g(2))$.

7. The sketch shows the function $f(x)$.
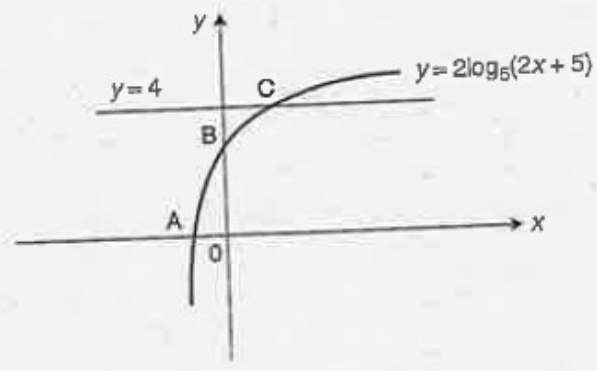
   Make a rough sketch of $f'(x)$.
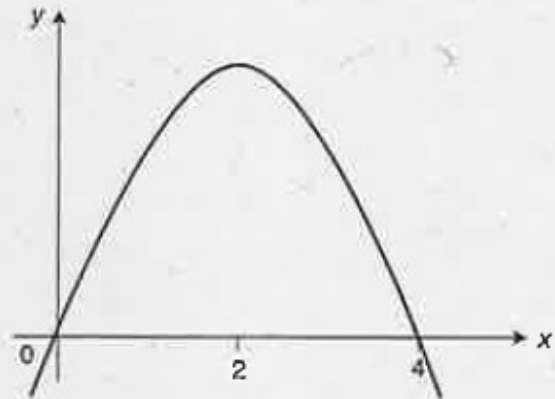


8. Evaluate $\displaystyle\int_1^4 \left( \sqrt{x} + \dfrac{1}{2\sqrt{x}} \right) dx$.

**9.** Find $f'\left(\dfrac{\pi}{2}\right)$ if $f(x) = 2 \cos 3x.$

**10.** A circle has equation $x^2 + y^2 - 6x + 8y = 0.$

Find the equation of the circle under reflection in the $x$-axis.

**11.** Find the coordinates of A, B and C when the equation of the curve is $y = 2\log_5(2x + 5)$ and the equation of the line is $y = 4$.



**12.** Given $A = (3, -1, 0)$, $B = (2, 0, 1)$ and $C = (1, 1, -1)$, show that angle $ABC = 90°$.