

1. Consider the function of two variables $f(x, y) = 3x^2 + xy - 2y$.

Find (i) $f(1, 2)$, (ii) $f(0, 3)$, (iii) $f(a, b)$, (iv) $f(a, 2b)$, (v) $f(a + b, a - b)$.

2. Find the inverse function of each given function:

(i) $f(x) = 3x - 3$, (ii) $g(Q) = \frac{Q - 3}{4}$ (iii) $h(t) = \frac{1}{t - 1}$ (iv) $F(X) = \frac{2X - 1}{X + 1}$.

3. Given the two functions $f(x) = 3x - 2$ and $g(x) = 2x^2 - 1$, find the functions

(i) $f(g(x))$, (ii) $g(f(x))$, (iii) $f(f(x))$, (iv) $g(g(x))$.

4. Find all the real roots of each given function:

(i) $f(x) = 1$, (ii) $f(x) = 2x - 3$, (iii) $f(x) = x^2 - 3x + 2$, (iv) $f(x) = x^2 - 6x + 9$,
(v) $f(x) = 3x^2 + 1$, (vi) $f(x) = x^3 - 8$, (vii) $f(x) = x^3 + 8$, (viii) $f(x) = x^4 - 16$.

5. (i) Given that $x = 2$ is a root of $f(x) = x^3 - 2x^2 + bx - 6$, find b .

(ii) Given that $x = 0$ and $x = 1$ are both roots of $f(x) = x^4 + x^3 - 2x^2 + ax + b$, find a and b and hence factorise the quartic and find another root.

6. Simplify the polynomial product $(x^2 - x - 6)(x^2 + 5x + 6)$, that is write this in standard polynomial form.