

(1) Simplify the following algebraic fractions:

(a) $\frac{x^2 + 2x}{x}$

(b) $\frac{2x^2 - 3x + 5}{x}$

(c) $\frac{x^2 - x - 12}{x - 4}$

(d) $\frac{2x^2 - 5x - 12}{2x + 3}$

(e) $\frac{4x^2 - 25}{2x - 5}$

(f) $\frac{a^2 - b^2}{2(a + b)}$

(2) Explain whether or not you can use long division to simplify the following fractions:

(a) $\frac{x^2 + 2x + 4}{2x^2 + 3x + 1}$

(b) $\frac{4x^3 - 2x^2 + 3}{x + 1}$

(c) $\frac{3x^2 + x - 4}{x^3 + 7x + 4}$

(3) Find the quotient when $x^3 + 2x^2 - 4x + 1$ is divided by $x - 1$.

(4) Find the quotient **and** remainder when $x^4 + 3x^3 + x^2 - 2x + 1$ is divided by $x - 2$.

(5) Find the quotient **and** remainder when $2x^4 + 3x^2 + x - 3$ is divided by $x + 3$.

(6) Simplify $\frac{4x^3 - 7x^2 + 2x + 1}{2x - 3}$

(7) Show that $(x + 2)$ is a factor of $x^3 - x^2 + x + 14$

(8) State which of the following are factors of

$$2x^4 + 3x^3 - 24x^2 - 13x + 12 :$$

(i) $(x - 3)$

(ii) $(x - 1)$

(iii) $(2x - 1)$

(iv) $(x + 4)$

(9) Explain why $(3x - 2)$ is not a factor of $x^4 + 5x^2 + 2x - 1$.

(10) Given that $(x - 2)$ is a factor of $2x^3 - x^2 + 2p + 3$ find the value of p .

(11) $f(x) = x^3 + px^2 + qx + 6$
Given that $(x - 3)$ and $(x + 1)$ are factors of $f(x)$, find the values of p and q .

(12) $g(x) = 2x^3 - 7x^2 - 10x + 24$
Given that $(x - 4)$ is a factor of $g(x)$, fully factorise $g(x)$.

(13) Solve the equation $x^3 + x^2 - 17x + 15 = 0$.

(14) Find the remainder when $x^3 + 2x^2 - 4x + 2$ is divided by $(x - 1)$.

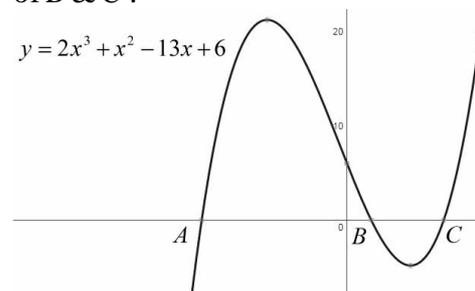
(15) When $4x^3 - px^2 + 3$ is divided by $(x + 1)$ the remainder is 4. Find the value of p .

(16) $f(x) = 2x^3 + px^2 + x + q$
When $f(x)$ is divided by $(x + 3)$ the remainder is -12. Given also $(x - 1)$ is a factor of $f(x)$ find the values of p and q .

(17) Given when $4x^2 - ax + 3$ is divided by $(x + 1)$ the remainder is the same as when it's divided by $(x - 2)$, find the value of the constant a .

(18) The graph below shows part of the curve

$y = 2x^3 + x^2 - 13x + 6$. Given that $A = -3$, find the values of B & C .



(19) $f(x) = 3x^3 + 4x^2 + px - 2$

(a) Given $(x - 1)$ is a factor of $f(x)$ show that $p = -5$.

(b) Find all of the solutions to the equation $f(x) = 0$.

(20) Given that

$$\frac{x^4 - x^3 - 19x^2 - 11x + 30}{(x + 2)}$$

can be written in the form

$$(Ax^3 + Bx^2 + Cx + D)$$

show that $A + B + C + D = 0$.

(21) When $4x^3 + ax^2 + bx - 2$ is divided by $(1 - 2x)$ the remainder is 6.

(a) Find a linear relationship between a and b .

(b) Given further that $\frac{a}{3} = b$,

find the value of $(ab)^{0.5}$ in the form $k\sqrt{3}$ where k is a constant to be found.

(22) Sketch the graph of

$y = 2x^3 - 5x^2 - x - 6$ showing any points of intersection with the coordinate axis.