1. Simplify
a. $\frac{5x^3 - 3x}{x}$
b. $\frac{x - 3}{3 - x}$
c. $\frac{x^2 - 1}{x - 1}$
d. $\frac{(x - 7)(x + 2)}{(x + 2)}$
e. $\frac{2x^2 - 5x - 3}{x^2 + 2x - 15}$
f. $\frac{(3x + 6)(x - 4)}{(2x - 8)(x + 2)}$
g. $\frac{6x^2 - x - 1}{6x^2 + x - 1}$
h. $\frac{(x + 3)(2x - 3)}{x^2 - 9}$

2. Divide $x^3 + 4x^2 + x - 6$ by $(x - 1)$ then factorise fully.

3. Use algebraic division to divide $x^3 - 3x^2 - 18x + 40$ by $(x - 5)$ and factorise fully.

4. Divide $2x^3 + x^2 - 4x + 1$ by $(x - 1)$ and factorise completely.

5. Divide $x^3 - 8x + 8$ by $(x - 2)$ then factorise fully.

6. Factorise fully by first using algebraic division to find the result of $-x^3 + 3x^2 + 4x - 12$ divided by $(2 - x)$.

7. Factorise $x^3 - x^2 + x - 1$ fully.

8. Divide $3x^3 + 3x^2 + x - 2$ by $(x + 1)$.

9. Divide $2x^3 + 5x^2 + 8x - 12$ by $(x - 4)$.

10. Divide $-x^4 - 3x + 2$ by $(x - 2)$

11. Explain the difference between the factor and the remainder theorem.

12. Show that $(x - 3)$ is a factor of $x^3 + 5x^2 - 12x - 36$ by
(a) algebraic division, and
(b) the factor theorem

13. Factorise
(a) $x^3 + x^2 - x - 1$
(b) $6x^3 - 5x^2 - 17x + 6$
(c) $3x^3 + 13x^2 - 6x - 40$

14. Find the remainders for the following:
a. $(x^3 - 5x^2 + 6x - 4) \div (x - 2)$
b. $(4x^3 + 3x^2 + x + 2) \div (x - 1)$
c. $(2x^4 - x^3 + 3x^2 - 1) \div (x + 1)$
d. $(2x^3 - 6x - 5) \div (x + 3)$
e. $(x^3 - 4x^2 - x) \div (x - 4)$

15. Factorise
a. $x^3 + 2x^2 - 5x - 6$
b. $2x^3 + x^2 - 2x - 1$
c. $x^3 - 3x^2 - 3x - 4$
d. $3x^3 + 6x^2 + x + 2$
e. $4x^3 - 15x^2 + 17x - 6$

16. Given that $(x - 1)$ is a factor of $2x^3 - 5x^2 + ax^2 - 3$, find the value of a.

17. When $3x^4 + 4x^2 - px + 3$ is divided by $(x + 2)$ the remainder is 5. Find the value of p.

18. When $x^4 + 4x^2 + bx - 7$ is divided by $(x + 3)$ the remainder is 101. Find the value of b.