Polynomials, factor theorem, remainder theorem

1. Show that $(2x + 1)$ is a factor of $2x^3 - 3x^2 + 2x + 2$
2. a. Show that $(x - 1)$ is a factor of $x^3 - 6x^2 + 11x - 6$

   b. Hence factorise $x^3 - 6x^2 + 11x - 6$
3. Show that when $4x^3 - 6x^2 + 5$ is divided by $(2x - 1)$ the remainder is 4
4. Divide $x^3 + 1$by $(x + 1)$
5. Find the quotient and the remainder when $x^4 + 2x^3 + 3x^2 + 7$is divided by $x^2 + x + 1$
6. Find the quotient and the remainder when $2x^3 + 3x^2 - 4x + 5$ is divided by $(x + 2)$
7. a. Show that $(2x - 1)$ is a factor of $12x^3 + 16x^2 - 5x - 3$

   b. Hence factorise $12x^3 + 16x^2 - 5x - 3$
8. The expression $2x^3 - 5x^2 - 16x + k$ has a remainder of -6 when divided by $(x - 4)$. Find the value of k
9. When $x^5 + 4x^4 - 6x^2 + ax + 3$ is divided by $(x + 2)$ the remainder is 5. Find the value of a
10. When $ax^3 + 16x^2 - 5x - 5$ is divided by $(2x - 1)$ the remainder is -2. Find the value of a
11. The polynomial $4x^3 - 4x^2 + ax + 1$, where a is a constant, is denoted by $p(x)$. When $p(x)$ is divided by $(2x - 3)$ the remainder is 13. Find the value of a
12. The polynomial $x^3 + ax^2 + bx + 1$, where a and b are constants, is denoted by $p(x)$. When $p(x)$ is divided by $(x - 2)$ the remainder is 9 and when $p(x)$ is divided by $(x + 3)$ the remainder is 19. Find the value of a and the value of b
13. When $5x^3 + ax + b$ is divided by $(x - 2)$, the remainder is equal to the remainder obtained when the same expression is divided by $(x + 2)$. Find the value of a
14. The polynomial $2x^4 + 3x^2 - x + 2$ is denoted by $p(x)$. Show that the remainder when $p(x)$ is divided by $(x + 2)$ is 8 times the remainder when $p(x)$ is divided by $(x - 1)$

15. The polynomial $x^3 + ax + b$ where a, b are constant, is denoted by $p(x)$. When $p(x)$ is divided by $(x - 1)$ the remainder is 14 and when $p(x)$ is divided by $(x - 4)$ the remainder is 56. Find the values of a, b

16. The polynomial $x^3 + ax^2 + 2$, where a is a constant, denoted by $p(x)$. When $p(x)$ is divided by $(x + 1)$ the remainder is one more than when $p(x)$ is divided by $(x + 2)$. Find the value of a

17. When $6x^2 + x + 7$ is divided by $(x - a)$, the remainder is equal to the remainder obtained when the same expression is divided by $(x + 2a)$, where $a \neq 0$, find value of a

18. a. Show that $(2x - 5)$ is a factor of $4x^3 - 20x^2 + 19x + 15$

    b. Hence factorise $4x^3 - 20x^2 + 19x + 15$ as a product of three linear factors.

19. The polynomial $ax^3 - 3x^2 - 5ax - 9$ is denoted by $p(x)$. It is given that $(x - a)$ is a factor of $p(x)$. Find the possible values of a

20. The polynomial $3x^3 + 2x^2 - bx + a$, where a and b are constants, is denoted by $p(x)$. I is given that $(x - 1)$ is a factor of $p(x)$ and that when $p(x)$is divided by $(x + 1)$ the remainder is 10. Find the values of a & b.

21. The polynomial $ax^3 + bx^2 - 5x + 3$, where a and b are constants, is denoted by $p(x)$. I is given that $(2x - 1)$ is a factor of $p(x)$ and that when $p(x)$is divided by $(x - 1)$ the remainder is -3. Find the remainder when $p(x)$ is divided by $(x + 3)$

22. Factorise $2x^4 + 5x^3 - 5x - 2$as a product of four linear factors