

Differentiation 2

1. $y = x^2 + x - 2$

- Using a scale of 1cm to 1 unit, plot the graph of $y = x^2 + x - 2$ for $-3 \leq x \leq 3$
- Estimate the gradient of the tangent to the curve at the point (2,4)
- Estimate the gradient of the tangent to the curve at the point (-1, -2)

2. $y = x^3 - 3x + 1$

- Estimate the gradient of the tangent to the curve at the point where $x = -1.5$
- Write down the coordinates of the points on the curve where the gradient of the tangent equal to 0

3. Find the gradient of the tangent to the curve $y = 5x^3 + 3x^2 - x + 4$ at the point (1,11)

4. Find the gradient of the tangent to the curve $y = x^3 - 8x^2 - 7$ where $x = -2$

5. Find the coordinates of the points on the curve with equation $y = 2x^3 + 3x^2 - 12x$ where the gradient is 24

6. Find the gradient of the tangent to the curve $y = 2x^2 + 3x + 1$ at each of the points where the curve meets the line $y = 4(x + 1)$

7. Find the gradient of the tangent to the curve $y = (2x + 3)^2$ at the point where $x = 0$

8. Find the gradient of the tangent to the curve $y = (x + 2)(x - 3)$ at each of the points where the curve crosses the x-axis

9. Find the coordinates of the points on the curve $y = 2x^3 - 15x + 7$ where the gradient is 9

10. Find the values of x where tangents to the curve $y = x^3 - x^2 - 42x - 7$ are parallel to the line $y = -2x$

11. Find the coordinates of the points on the curve $y = x^4 + 2x^3$ where the gradient is parallel to the x-axis

12. The gradient of the tangent to the curve $y = 2x^3 + ax^2 - x + 3$ at the point $x = 1$ is 3. Find the value of a

13. Find the y-coordinate and the gradient of $y = (x - 3)^2$ when $x = -2$

14. Find the gradient of the tangent to the curve $y = \frac{(4x-1)^2}{x^2}$ at the point (-1,25)

15. Find the coordinates of the points on the curve $y = 6 + 9x - 3x^2 - x^3$ where the gradient is 9

16. Find the gradient of the tangent to the curve $y = (\sqrt{x} + 3)(3\sqrt{x} - 5)$ at the point where $x = 1$

17. Find the coordinates of the point on the curve $y = \frac{2x-5+\sqrt{x}}{x}$ where the gradient is zero

18. Given that $y = 8x^3 - 3x + \frac{4}{x}$, find the value of $\frac{d^2y}{dx^2}$ when $x = -2$

19. Given that $f(x) = \frac{4}{\sqrt{3x-2}}$, find the value of $f''(2)$

20. Find $\frac{d^2y}{dx^2}$ when $\frac{dy}{dx} = 1 - 7x^2$

21. Given that $y = 6x^3 - 2x^2$, show that $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 20 = 4(4 + 13x - 18x^2)$

22. Given that $f'(x) = \frac{5}{(5-2x)^8}$, find $f''(x)$

23. Given that $f(x) = 2x^4 - 3x^3 - x^2$, find the value of

a. $f'(3)$

b. $f''(-2)$

c. $\frac{1}{f(1)}$

24. Given that $y = ax^4 - 3x^2$, and $\frac{d^2y}{dx^2} = 42$ when $x=2$, work out the value of a

25. Given that $\frac{dy}{dx} = \frac{6x-1}{2x^4}$, find the value of $\frac{d^2y}{dx^2}$ when $x = 1$

26. The curve $y = 2x^3 + 6x - 5$ crosses the y -axis at the point P. Find the equation of the tangent to the curve at the point P

27. Find the equation of the tangent and the normal to the curve $y = 2x^3 - x$ at point where $x=2$

28. Find the equations of the tangents to the curve $y = x^2 - x - 12$ at each of the points where the curve crosses the x -axis

29. The curve $y = (5 - x)(2 + x)$ crosses the x -axis at points A and B. The tangents at the points A and B meet at point C. Find the coordinates of C