

Differentiation

1. $f(x) = 3x^3 - 4x$. Calculate the value of $f'(1)$.
2. $f(x) = (2x - 1)^2$. Find $f'(-2)$
3. $y = 4x^2 - 3x + 5$. Calculate the value of $\frac{dy}{dx}$ when $x = 2$.
4. $y = \frac{x^2 - 1}{x}$. Find the value of $\frac{dy}{dx}$ when $x = 3$.
5. $f(x) = \sqrt{x}(4 + 2\sqrt{x})$. Find $f'(4)$.
6. $f(x) = x^3(x - 1)$. Find the value of $f'(-1)$.
7. $y = \frac{x - 3x^2}{x^3}$. Calculate the value of $\frac{dy}{dx}$ when $x = -2$.
8. $f(x) = \left(x + \frac{1}{x}\right)^2$. Find $f'(1/2)$.
9. $f(x) = \frac{x^2 - 2x}{\sqrt{x}}$. Calculate $f'(16)$.
10. $y = \frac{x^3 - 6x}{x\sqrt{x}}$. Find the value of $\frac{dy}{dx}$ when $x = 4$.
11. $f(x) = \frac{\sqrt{x} + x}{x^2}$. Find $f'(1)$
12. Find the rate of change of $y = 6x - 2x^2$ at $x = 2$.
13. Find the rate of change of $y = \frac{1 - 4x}{x^2}$ at $x = -2$.
14. $f(x) = x(3x - 1)^2$. Find the gradient of the tangent to this curve at $x = -1$.
15. $f(x) = \frac{x - 3}{x^2\sqrt{x}}$. Find the gradient of the tangent to $f(x)$ at the point where $x = 1$.
16. The distance, d metres, travelled on a fairground ride is calculated using the formula $d(t) = 8t^2 - 4t$, where t is the time in seconds after the start of the ride. Calculate the speed of the ride after 3 seconds.
17. The height, h , of a ball thrown upwards is calculated using the formula $h(t) = 30t - 2t^2$, where t is the time in seconds after the ball is thrown. Calculate the rate of change in the height of the ball after
(a) 5 seconds (b) 7.5 seconds. Explain your answer.