

Week 4: Differentiation

Solutions

1. $y = 2x^3$

$$y' = 3 \cdot 2x^2 = 6x^2$$

(a) Find y'

Solution: $y' = 6x^2$

(b) Find y''

Solution: $y'' = 12x$

3. $y = x^3 - 4x^2 - 3x + 9$

(a) Find y'

Solution: $y' = 3x^2 - 8x - 3$

(b) Find the range values of x for which y is increasing

Solution: y is increasing when the gradient is positive, i.e. when $x < -\frac{1}{3}$ and $x > 3$

4. Let $y = 5x^2 + 4\sin(3x)$ Find y'

Solution: $y' = 10x + 12\cos(3x)$

5. Given that $y = \frac{1}{x+2}$ find y'

(a) using the product rule,

Solution: $y' = (-1)(x+2)^{-2} + (x+2)^{-1} = \frac{2}{(x+2)^2}$

(b) using the quotient rule.

Solution: $y' = \frac{+2-1}{(x+2)^2} = \frac{2}{(x+2)^2}$

6. $y = \frac{x^2}{x+4}$ Find y'

Solution: $y' = \frac{2x+8}{(x+4)^2}$

7. Differentiate with respect to x

(a) $(x^2 - 4)^3$

Solution: $6x(x^2 - 4)^2$

(b) $2(3x^2 + 1)^6$

Solution: $72x(3x^2 + 1)^5$

(c) x^{2+3}

Solution: $(2x + 3)x^{2+3}$