TK Maths Tuition UK
A-Level Differentiation Worksheet – Answers

Section A – Basics

1. $y' = 15x^2 - 7$

2. $y' = -8x^{-3} + (9/2)x^{-1/2}$

3. $y' = -12x^{-5} - x^{-1/2}$

Section B – Product Rule

4. $y' = (6x)(2x + 5) + (3x^2 - 1)(2)$

5. $y' = 1 \cdot (4x^3 + 7) + x(12x^2) = 4x^3 + 7 + 12x^3 = 16x^3 + 7$

6. $y' = (2)(x^2 + 6x) + (2x - 3)(2x + 6)$

Section C – Quotient Rule

7. $y' = [(10x)(2x + 1) - (5x^2 - 3)(2)] / (2x + 1)^2$

8. $y' = [(3)(x^2 - 9) - (3x + 4)(2x)] / (x^2 - 9)^2$

9. $y' = [(7)(x^2 + 1) - 7x(2x)] / (x^2 + 1)^2$

Section D – Chain Rule

10. $y' = 3(4x^2 - 5)^2 \cdot (8x)$

11. $y' = (1 / [2\sqrt{(3x^2 + 4)}]) \cdot (6x)$

12. $y' = 4(5 - 2x)^3 \cdot (-2)$

Section E – Applications

13. Tangent at $x = 2$: $y = x^3 - 4x \rightarrow y' = 3x^2 - 4 \rightarrow y'(2) = 8 \rightarrow$ tangent passes through $(2,0)$: $y = 8(x - 2)$

14. $y' = 12x^3 - 48x^2 + 18 \rightarrow$ increasing where $y' > 0$ (solve cubic inequality)

15. $y' = 3x^2 - 12x + 5$. Solve $y' = 0$ for stationary points. Use $y'' = 6x - 12$ for nature.