Core 3 Differentiation Questions

(b) Given that \( y = \frac{3x + 1}{2x + 1} \), show that \( \frac{dy}{dx} = \frac{1}{(2x + 1)^2} \). (3 marks)

---

2 (a) Find \( \frac{dy}{dx} \) when \( y = (3x - 1)^{10} \). (2 marks)

---

6 (a) Find \( \frac{dy}{dx} \) when:

(i) \( y = (4x^2 + 3x + 2)^{10} \); (2 marks)

---

2 (a) Differentiate \( (x - 1)^d \) with respect to \( x \). (1 mark)

---

Why so short?

Because the techniques learnt are embedded and checked in questions on other topics.
Core 3 Differentiation Answers

(b) \[
\frac{dy}{dx} = \frac{(2x+1)^3 - 2(3x+1)}{(2x+1)^2} = \frac{6x+3 - 6x-2}{(2x+1)^2} \\
= \frac{1}{(2x+1)^2}
\]

| M1 | A1 | 3 | use of quotient rule, AG (no errors) |

Alternative
\[
\frac{1}{(2x+1)^2} = \frac{1}{(2x+1)^2} \quad (A1)
\]

Alternative:
\[
y = \frac{3}{2}(2x+1)^{-1} \quad M1A1
\]
\[
\frac{dy}{dx} = (2x+1)^{-2} \quad A1
\]
\[
= \frac{1}{(2x+1)^2} \quad AG
\]

2(a) \[
y = (3x - 1)^6
\]
\[
\frac{dy}{dx} = 10 (3x - 1)^5 \times 3
\]
\[
= 30 (3x - 1)^5 \quad M1 A1 \quad 2 \quad M1 \text{ for } a(3x - 1)^6 \text{ where } a = \text{constant}
\]

6(a)(i) \[
y = (4x^2 + 3x + 2)^10
\]
\[
\frac{dy}{dx} = 10 \left(4x^2 + 3x + 2\right)^9 (8x + 3) \quad M1 \quad A1 \quad 2 \quad \text{For } f(x)^n \text{ where } f(x) \neq k \text{ and is linear}
\]

2(a) \[
4(x - 1)^3 \text{ or in expanded form} \quad B1 \quad 1 \quad \text{allow } -4(1 - x)^3
\]

Why so short?

Because the techniques learnt are embedded and checked in questions on other topics.