Year 11 Mathematics Advanced

Topic: Introduction to Differentiation (2 of 6)
Review Questions: The Differentiation Rules
Term 3, 2026

How to use this review set

These are real past-paper questions, grouped by question pattern. The grey label on each question shows where it is from and its marks.

- The questions are grouped by the pattern that keeps coming up in exams, a few of each in a row, running from the plainer patterns into the harder ones near the end. Work through them and you will meet every type an exam can throw at you.
- This set **is your diagnostic**. Working through it shows you exactly which patterns are solid and which need work. Attempt every question properly in your own book, and go back to your notes to help you work through tough questions if needed.
- Every question you get wrong, need help with or struggle with goes in your **Mistakes Log**, which you should be working on daily to get you exam-ready.

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Chain, product and quotient rules

1. The chain rule

Q1 Barker 2021 Prelim Q12(bβ) · **1 mark**

Differentiate the following. Leave your answers with a positive, non-fractional index, where necessary. $y = (3x^2 + 5x)^4$.

Q2 Baulkham Hills 2021 Prelim Q11(a) · **2 marks**

Differentiate the following with respect to x. $(3x^2 + 1)^4$.

Q3 Baulkham Hills 2022 Prelim Q12 · **2 marks**

Differentiate $(3x^2 + 1)^5$.

Q4 Knox 2022 Prelim Q3 · **1 mark**

What is the derivative of $(1 - 2x)^5$?

(A) $5(1 - 2x)^4$

(B) $-5(1 - 2x)^4$

(C) $10(1 - 2x)^4$

(D) $-10(1 - 2x)^4$

Q5 Hurlstone 2023 Prelim Q13(b(i)) · **1 mark**

Differentiate the following expression with respect to t. $2(5t + 6)^8$.

Q6 Hornsby Girls 2022 Prelim Q17(b) · **1 mark**

Consider the semi-circle defined by function $f(x) = \sqrt{8 - x^2}$. Show that $f'(x) = \dfrac{-x}{\sqrt{8 - x^2}}$.

Q7 Hurlstone 2021 Prelim Q8 · **1 mark**

The derivative of $y = 3x^2(2x^3 + 1)^3$ is given by which of the following?

(A) $6x(2x^3 + 1)^2(9x^3 + 1)$

(B) $6x(2x^3 + 1)^2(9x^3 + 2x + 1)$

(C) $6x(2x^3 + 1)^2(11x^3 + 1)$

(D) $6x(2x^3 + 1)^2(11x^3 + 2x + 1)$

Q8 Killara 2023 Prelim Q32(b) · **3 marks**

A particle moves in a straight line so that its displacement x cm over time t seconds is given by $x = t\sqrt{25 - t^2}$. Show that the velocity as a function of t can be given by $\dfrac{dx}{dt} = \dfrac{25 - 2t^2}{\sqrt{25 - t^2}}$.

Q9 Killara 2024 Prelim Q23(b) · **2 marks**

Differentiate the following function. $f(x) = \sqrt{3x - x^2}$.

2. The product rule

Q10 Sydney Grammar 2021 Prelim Q10(aiv) · **1 mark**

Differentiate with respect to x: $y = (x - 3)(x + 5)$.

Q11 Moriah 2021 Prelim Q17(a) · **2 marks**

Use the product rule to find $\dfrac{dy}{dx}$ where $y = x^3(3x - 2)^5$.

Q12 Hurlstone 2022 Prelim Q11(a) · **2 marks**

Differentiate the expression $(x^2 - 5)(9x - 2x^3)$ with respect to x.

Q13 Girraween 2022 Prelim Q8(biv) · **3 marks**

Differentiate $y = x(1 - x)^6$.

Q14 Killara 2022 Prelim Q21(a) · **2 marks**

Find $\dfrac{dy}{dx}$ for $y = (7x + 4)(x + 1)^3$.

Q15 Girraween 2023 Prelim Q9(b(iv)) · **2 marks**

Differentiate $y = x^3(4-3x)^5$.

Q16 Blacktown Boys 2022 Prelim Q23(a) · **3 marks**

Given that $f(x) = (3-2x)\sqrt{4x+1}$, show that $f'(x) = \dfrac{4(1-3x)}{\sqrt{4x+1}}$.

Q17 Kambala 2023 Prelim Q14(b) · **2 marks**

Differentiate the following with respect to x. $y = (x^2-2)^3(x+3)^2$.

3. The quotient rule

Q18 Barker 2021 Prelim Q13(a) · **2 marks**

Differentiate $f(x) = \dfrac{x^2-1}{2x+5}$.

Q19 St George Girls 2021 Prelim Q1(aii) · **2 marks**

Differentiate with respect to x: $y = \dfrac{4}{\sqrt{3x-1}}$.

Q20 Presbyterian 2022 Prelim Q26 · **3 marks**

Differentiate $y = \dfrac{x^2+1}{4x-7}$, giving your answer in simplest form.

Q21 Killara 2023 Prelim Q21(c) · **2 marks**

Differentiate the following function: $f(x) = \dfrac{x^2}{2x+1}$.

Q22 North Sydney Girls 2021 Prelim Q3(a) · **2 marks**

Differentiate $f(x) = \dfrac{1-x}{x+1}$. Fully simplify your answer.

Q23 Barker 2024 Prelim Q15(a(iii)) · **2 marks**

Differentiate and simplify the following function with respect to x: $f(x) = \dfrac{5x^2}{x^2+1}$.

Q24 Kambala 2023 Prelim Q8 · **1 mark**

Megan tries to differentiate the function $y = \dfrac{3x}{(10-x)^2}$ with respect to x. Her working out is shown below.

$$\begin{aligned}
\frac{dy}{dx} &= \frac{3(10-x)^2 + 3x \times 2(10-x)}{(10-x)^4} && \text{Line (1)} \\
&= \frac{3(10-x)^2 - 6x(10-x)}{(10-x)^4} && \text{Line (2)} \\
&= \frac{(10-x)[3(10-x) + 6x]}{(10-x)^4} && \text{Line (3)} \\
&= \frac{30 + 3x}{(10-x)^3} && \text{Line (4)} \\
&= \frac{10 + x}{(10-x)^3} && \text{Line (5)}
\end{aligned}$$

Where did Megan make mistakes?

(A) Line 1 & Line 5

(B) Line 3 & Line 4

(C) Line 1 & Line 3

(D) Line 3 & Line 5

Q25 Killara 2024 Prelim Q26(a) · **3 marks**

Given that $f(x) = \dfrac{\sqrt{x}}{x+1}$, show that $f'(x) = -\dfrac{x-1}{2\sqrt{x}\,(x+1)^2}$.

Q26 Presbyterian 2023 Prelim Q24 · **3 marks**

Show that $\dfrac{d}{dx}\left(\dfrac{x}{\sqrt{x-1}}\right) = \dfrac{x-2}{2\sqrt{(x-1)^3}}$.