

ATAR Survival Guide's Practice Chain Rule Questions

You may freely use and share this document if the ATAR Survival Guide moral rights are respected (i.e. Christian Bien, ATAR Survival Guide and its website are still referenced).

You should attempt all these questions without the use of a calculator.

Question 1 (2 marks)

Find $\frac{dy}{dx}$ where $y = u^3$, $u = 4x$ using the chain rule.

Question 2 (2 marks)

Differentiate $y = (3x^2 + 4)^{\frac{1}{3}}$ using the chain rule. I.e. make $u = 3x^2 + 4$. Do not simplify.

Question 3 (3 marks)

Differentiate $y = \frac{1}{(3x^3+9)}$ using the chain rule. You do not need to expand the equation.

Question 4 (2 marks)

Differentiate $y = 3x + (2x + 2)^5$. You do not need to expand the equation.

Question 5 (2 marks)

Differentiate $y = (5x^3 + 4x^2)^{-2}$. You do not need to expand.

Answer Key

Question 1

$$\frac{dy}{dx} = \frac{dy}{du} * \frac{du}{dx}$$

$$\frac{dy}{dx} = 3u^2 * 4$$

$$\frac{dy}{dx} = 12u^2$$

$$\frac{dy}{dx} = 20 * 16x^2$$

$$\frac{dy}{dx} = 320x^2 \checkmark \checkmark$$

Question 2

$$y = u^{\frac{1}{3}}$$

$$\frac{dy}{dx} = \frac{dy}{du} * \frac{du}{dx}$$

$$\frac{dy}{dx} = \frac{1}{3} u^{-\frac{2}{3}} * 6x$$

$$\frac{dy}{dx} = \frac{1}{3} * 6x * (3x^2 + 4)^{-\frac{2}{3}} \checkmark \checkmark$$

Question 3

$$y = \frac{1}{u}, u = 3x^3 + 9$$

$$\frac{dy}{dx} = -u^{-2} * 9x^2$$

$$\frac{dy}{dx} = 9x^2 * -\frac{1}{(3x^3+9)^2}$$

$$\frac{dy}{dx} = -\frac{9x^2}{(3x^3+9)^2} \checkmark \checkmark$$

Question 4

$$y = 3x + u^5, u = 2x + 2$$

$$\frac{dy}{dx} = 3 + 5u^4 * 2$$

$$\frac{dy}{dx} = 3 + 10(2x + 2)^4 \checkmark \checkmark$$

Question 5

$$y = u^{-2}, u = 5x^3 + 4x^2$$

$$\frac{dy}{dx} = -2u^{-3} * (15x^2 + 8x)$$

$$\frac{dy}{dx} = -2(5x^3 + 4x^2) * (15x^2 + 8x) \checkmark \checkmark$$