

## Differentiation - Chain Rule

Differentiate each function with respect to  $x$ .

1)  $y = (x^3 + 3)^5$

2)  $y = (-3x^5 + 1)^3$

3)  $y = (-5x^3 - 3)^3$

4)  $y = (5x^2 + 3)^4$

5)  $f(x) = \sqrt[4]{-3x^4 - 2}$

6)  $f(x) = \sqrt{-2x^2 + 1}$

7)  $f(x) = \sqrt[3]{-2x^4 + 5}$

8)  $y = (-x^4 - 3)^{-2}$

$$9) y = (3x^3 + 1)(-4x^2 - 3)^4$$

$$10) y = \frac{(x^3 + 4)^5}{3x^4 - 2}$$

$$11) y = ((x + 5)^5 - 1)^4$$

$$12) y = (5x^3 - 3)^5 \sqrt[4]{-4x^5 - 3}$$

**Critical thinking question:**

- 13) Give a function that requires three applications of the chain rule to differentiate. Then differentiate the function.