SIMPLE DERIVATIVES or FINDING GRADIENTS OF CURVES or DIFFERENTIATING.

ANSWERS

GENERAL RULE

If $y = x^n$

then $y' = n\,x^{n-1}$

This rule works for ALL numerical values of n.

Eg. 1. $y = x^8$

$y' = 8x^7$

2. $y = x^{-9}$

$y' = -9\,x^{-10}$

3. $y = x^{6.4}$

$y' = 6.4\,x^{5.4}$

4. $y = x^{7/8}$

$y' = \frac{7}{8}\,x^{-1/8}$

5. $y = 5x^2$

$y' = 10x^1 = 10x$

6. $y = 4x = 4\,x^1$

$y' = 1 \times 4\,x^0 = 4$

but we should not go to this trouble in cases like this. It is better to think of y = 4x as a line of gradient 4. In other words there is no need to use the general rule for x to the power 1.

7. *Similarly y = 6 is a horizontal line so its gradient is zero.* $y' = 0$

Applying the general rule is possible but not advisable.

Eg $y = 6 = 6\,x^0$

So $y' = 0 \times 6 \times x^{-1} = 0$

Find the gradient functions

(or differentiate these equations)

(or find the derivatives)

(or find the derived functions)

1. $y = x^5$ $\quad y' = 5x^4$

2. $y = 4x^7$ $\quad y' = 28\,x^6$

3. $y = x^{-4}$ $\quad y' = -4\,x^{-5}$

4. $y = x^{1.6}$ $\quad y' = 1.6\,x^{0.6}$

5. $y = x^{2/3}$ $\quad y' = \frac{2\,x^{-1/3}}{3}$

6. $y = 12\,x^{1/3}$ $\quad y' = 4\,x^{-2/3}$

7. $y = 8\,x^{-1/2}$ $\quad y' = -4\,x^{-3/2}$

8. $y = 6x$ $\quad y' = 6$

9. $y = 2$ $\quad y' = 0$

10. $y = x^3 + 5\,x^2 + 7x + 4$

$y' = 3x^2 + 10x + 7$

11. $y = (x + 5)^2 = (x+5)(x+5)$

$= x^2 + 10x + 25$

$y' = 2x + 10$

12. $y = (3x + 4)(2x - 5)$

$= 6x^2 - 7x - 20$

$y' = 12x - 7$

13. $y = \frac{x^{12} + x^7}{x^3} = \frac{x^{12}}{x^3} + \frac{x^7}{x^3}$

$= x^9 + x^4$

$y' = 9x^8 + 4x^3$

14. $y = \frac{x^9 + x^5}{x^3} = x^6 + x^2$

$y' = 6x^5 + 2x$

15*. $y = \frac{x^8 + x^2}{x^5} = x^3 + x^{-3}$

$y' = 3x^2 - 3x^{-4}$

16* $y = \sqrt{x} = x^{1/2}$

$y' = \frac{1}{2}\,x^{-1/2}$

17. $y = \frac{1}{x^4} = x^{-4}$

$y' = -4\,x^{-5}$

18. $y = \frac{5}{x^2} = 5\,x^{-2}$

$y' = -10\,x^{-3}$

19.* $y = \frac{4}{3x^7} = \frac{4\,x^{-7}}{3}$

$y' = \frac{-28x^{-8}}{3}$

20. $y = \frac{x^3 - 4x}{\sqrt{x}}$

$= \frac{x^3 - 4x}{x^{1/2}}$

$= x^{5/2} - 4\,x^{1/2}$

$y' = \frac{5}{2}\,x^{3/2} - 2\,x^{-1/2}$