IGCSE Differentiation*

Name:		Class:	

1. Differentiate the following functions.

$y = 4x^3 + 6x$ (2)

$f(x) = (x-3)^2$ (3)

$g(x) = \frac{5}{9}x^{10} + 15$ (3)

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

$h(x) = 5\sqrt{x} + 6$ (3)

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

2. The function $f(x) = 4x^2 + 3x + 5$ has a gradient of 17 at which co-ordinate?

(,)

(4)

3. The function $f(x) = ax^2 + 7x$ where a is a constant has a gradient of 19 when $x = 2$. Calculate a.

(3)

4. The function $g(x) = 3x^2 + 4x + 6$. What is the gradient at the point $(a, 26)$ where $a < 0$.

(4)

5. The population of a city (P) over time (t) in years, can be modelled by the function $P(t) = 10t^{\frac{3}{2}}$. Find the rate of change after 9 years.

(3)

6. A company's profit function is given by $P(x) = -6x^2 + 9x + 10$. Find the value of x that maximises the profit.

(4)

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7. A vaccine is injected into the bloodstream where the percent concentration (C) of the vaccine after (t) minutes in the bloodstream is modelled by $\frac{2}{t^2}$. At what value of t will $\frac{dC}{dt}$ equal to 108?

(5)

8. Consider the function $f(x) = ax^a + 5$ where a is an integer. $f'(x)$ when $x = 1$ is a quarter of the value of $f'(x)$ when $x = 2$. Calculate the value of a.

$a =$

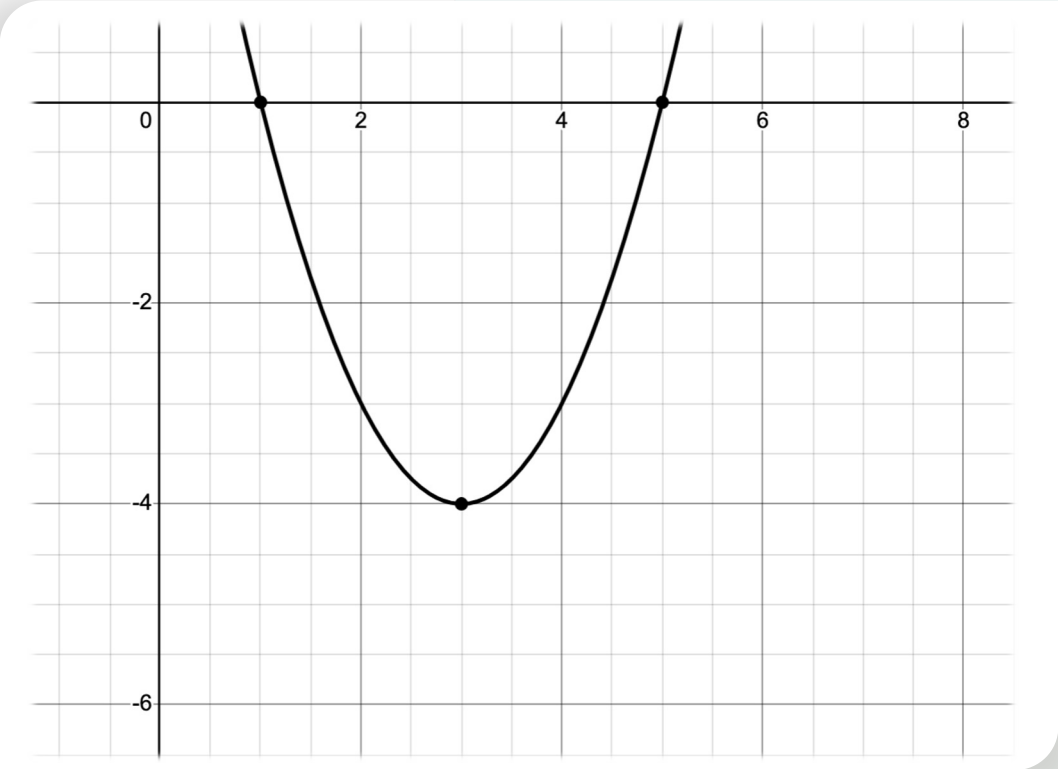
(5)

9. James thinks that the derivative of $f(x) = 5x^3 - 3x^2$ is equal to $15x^3 - 6x^2$. Explain why he is wrong.

Hint: Refer to the power rule!

(2)

10. The graph below shows the quadratic function $f(x)$.



a. The function can be written in the form $(x-a)(x-b)$. Calculate a and b.

$a =$ $b =$

(3)

CHALLENGE b. Plot the derivative of $f(x)$ on the graph.

(3)

11. A function $f(x)$ can be expressed as $(x + a)(x + b)$ where a and b are both positive integers, and $b = 2a$.

The curve passes through point $(1,15)$. Calculate the gradient of the curve at this point.

(6)

12. The function $f(x) = 4x^3 + 6x^2 + 2$. Calculate the co-ordinates of both turning points.

(..... , ...)

(..... , ...)

(6)

KINEMATICS- Displacement, Velocity & Acceleration

13. The position of a car on a straight line in relation to time can be modelled by the function $s(t) = 6t^3 + 4t^2 + 5$.

a. Calculate the car's velocity at time $t = 2.5s$

m/s (3)

b. Calculate the acceleration when the velocity equals $26m/s$.

m/s^2 (5)

CHALLENGE

14. Find the equation of the tangent to the curve $y = 2x^2 + 5x + 2$ at point $(2,20)$ in the form $y = mx + c$.

(5)

Resources

Optimisation video

Kinematics video

Introduction to Differentiation video

Tip: The more you practice differentiation the better you will become!