

Pre-test: Introduction to differential calculus

Show working for all problems. State answers exactly or to three significant figures.

1. Write down the derivative of the function $f(x) = x^2 + 3x + 4$.
2. A function is given as $y = ax^2 + bx + 6$.
 - (a) Find $\frac{dy}{dx}$.
 - (b) If the gradient of this function is 2 when x is 6, write an equation in terms of a and b .
 - (c) If the point $(3, -15)$ lies on the graph of the function find a second equation in terms of a and b .
 - (d) Solve for x in terms of a and b :

$$\frac{dy}{dx} = 0$$

Where have you seen this expression before?

3. Find $f'(x)$ for the following function. Express your final result without negative exponents:

$$f(x) = \frac{x^3 - 4x - 8}{x}$$

4. Find the equation of the tangent to $f(x) = \frac{4}{x^2}$ when $x = 1$.
5. Consider the function $f(x) = x^3 - 4x^2 - 3x + 18$.

- (a) Find $\frac{dy}{dx}$.
- (b) Find the values of $f(x)$ for a and b in the table below:

x	-3	-2	-1	0	1	2	3	4	5
$f(x)$	-36	a	16	b	12	4	0	6	28

- (c) Using a scale of 1 cm for each unit on the x -axis and 1 cm for each 5 units on the y -axis, draw the graph of $f(x)$ for $-3 \leq x \leq 5$. Label it clearly using IB conventions.
- (d) The gradient of the curve at any particular point varies. Within the interval $-3 \leq x \leq 5$, state all the intervals over which the gradient of the curve is
 - (i) Negative
 - (ii) Positive