BECA / Huson / 12.1 IB Math SL Name:
18 September 2017

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 points $(3, -15)$ 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 final answer 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