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A LEVEL MATHS

(69) Differentiation (Increasing and Decreasing Functions)

WORKING AT D/E

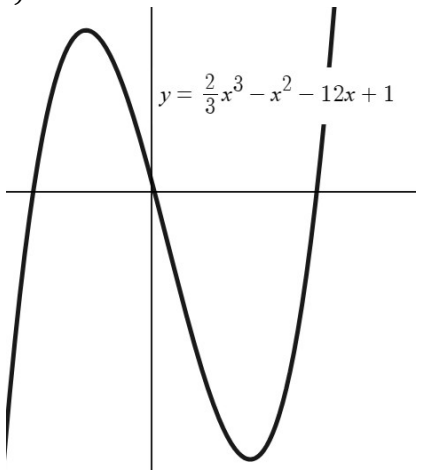
(1) Showing that the interval for which the function $f(x) = 3x^2 - 12x + 1$ is increasing is $x > 2$.

(2) (a) Show that the set of values for which the function $f(x) = \frac{8}{3}x^3 - x^2 - 3x + 9$ is decreasing a decreasing function satisfies the inequality
$0 > (4x - 3)(2x + 1)$
(b) Hence, find the set of values for which the function is decreasing.

WORKING AT B/C

(1) $f(x) = ax^3 - x + b,\ a > 0$
(a) Given that $f(x)$ is increasing when $x > 2$, find the value of a.
(b) Explain why the value of b doesn't change the answer to part (a)

(2) $f(x) = \frac{2}{3}x^3 - x^2 - 12x + 1$
The diagram shows part of the curve with equation $y = f(x)$



(a) Show that $f'(x)$ can be written as
$f'(x) = 2(x + 2)(x - 3)$
(b) Using your answer to part (a), find the values or set of values for which $f(x)$ is:
(i) Stationary, (ii) A decreasing function
(iii) An increasing function

(3) $f(x) = x + \frac{1}{x},\quad x \neq 0$
Show that the set of values for which $f(x)$ is increasing is $-1 < x\ , x > 1$.

WORKING AT A*/A

(1) $f(x) = 2x^3 + 5x^2 + 8x + 3$
(a) Show that $f(-0.5) = 0$
(b) Hence factorise $f(x)$
(c) Find $f'(x)$
(d) Show that $f(x)$ is an increasing function for all values of x
(e) Hence sketch the graph of $y = f(x)$ showing where the curve crosses the coordinate axes.

(2) $f(x) = (x + a)(x + b)(x + c)(x + d)$ where a, b, c and d are all different integers.
(a) Write down the number of intervals for which the function is increasing.
(a) Write down the number of intervals for which the function is decreasing.