D1 Quiz 3

Ravi Raghunathan

Department of Mathematics

August 23, 2017

D1/D2 Quiz 3

For the function $f(x)$ given below determine (i) The interval(s) in which it is increasing, (ii) the intervals in which it is concave or convex, (iii) its points of inflection (if any).

(A) $f(x) = 2x^3 + 3x^2 - 36x$

(B) $f(x) = 2x^3 - 3x^2 - 12x$

(C) $f(x) = 2x^3 + 3x^2 - 12x$

(D) $f(x) = 2x^3 - 6x^2 - 18x$

Marking scheme

Again, I'll give the marking scheme for A)
The intervals in which $f(x)$ are increasing are given by the condition $f(x) > 0$. This means that

$$x^2 + x - 6 = (x+3)(x-2) > 0.$$

This is true for $x \in (-\infty, -3)$ and $x \in (2, \infty)$.

(1 mark)

(Note: 1 mark should be give above, only if both intervals are correct)

The regions of concavity and convexity are given by

$$f''(x) < 0 \quad \text{and} \quad f''(x) > 0.$$

This yields $2x + 1 < 0$ and $2x + 1 > 0$, so $x < -1/2$ and $x > -1/2$ are the respective regions.

(1 mark)

$x = -1/2$ is a point of inflection.

(1 mark)

For the other options, I give $f'(x)$ and $f''(x)$ below (upto a constant multiple).

(B) $(x+1)(x-2), 2x-1$

(C) $(x+2)(x-1), 2x+1$

(D) $(x+1)(x-3), 2x-2$