Increasing and Decreasing Functions

Starter

1. **(Review of AS material)**
   Solve the inequality $2x^2 - 11x - 6 \geq 0$, expressing your answer in set notation:

Notes

While some functions are increasing (e.g. $y = e^x$) and some are decreasing (e.g. $y = \ln x$), most curves have sections where it is increasing and sections where it is decreasing.

Definition

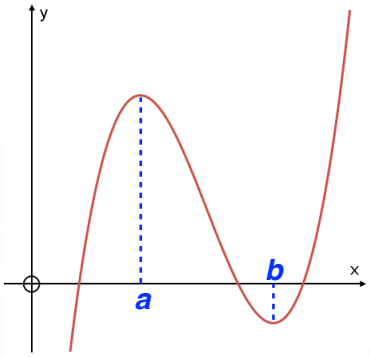
Sections where the function is increasing ⇒ gradient is positive i.e. $\frac{dy}{dx} > 0$

Sections where the function is decreasing ⇒ gradient is negative i.e. $\frac{dy}{dx} < 0$

For $x < a$, the curve is increasing since $\frac{dy}{dx} > 0$.

For $a < x < b$, the curve is decreasing since $\frac{dy}{dx} < 0$.

For $x > b$, the curve is increasing since $\frac{dy}{dx} > 0$.



How will we find the intervals where a function is increasing (or decreasing)?

Success Criteria — finding sections of increasing or decreasing function

1. Differentiate to find the derivative, $\frac{dy}{dx}$.
2. Form an inequality: $\frac{dy}{dx} > 0$ to find an increasing region; $\frac{dy}{dx} < 0$ to find a decreasing region.
3. Solve the inequality.

E.g. 1 Find the region(s) of increasing function of $y = x(x^2 - 3)$. Express your solution in set notation.

E.g. 2* Find the region(s) of decreasing function of $y = x + \frac{4}{x}$. Express your solution in set notation.

Video: Increasing and decreasing functions
Video: Increasing and decreasing functions EQ

Solutions to Starter and E.g.s

Exercise

p264 13E Qu 7i, 10, 13, 15-17

Summary

Sections where the function is increasing ⇒ gradient is positive i.e. $\frac{dy}{dx} > 0$

Sections where the function is decreasing ⇒ gradient is negative i.e. $\frac{dy}{dx} < 0$

Finding sections of increasing or decreasing function:

1. Differentiate to find the derivative, $\frac{dy}{dx}$.
2. Form an inequality: $\frac{dy}{dx} > 0$ to find an increasing region; $\frac{dy}{dx} < 0$ to find a decreasing region.
3. Solve the inequality.