9.9) Using second derivatives

Worked example	Your turn
Find the interval on which the function is concave: $$f(x) = x^3 - 2x + 5$$ $$g(x) = 2x^3 - 5x^2 - 6$$	Find the interval on which the function is concave: $$h(x) = x^3 + 4x + 3$$ $$x \leq 0$$

Worked example	Your turn
Find the interval on which the function is convex: $$f(x) = x^3 - 2x + 5$$ $$g(x) = 2x^3 - 5x^2 - 6$$	Find the interval on which the function is convex: $$h(x) = x^3 + 4x + 3$$ $$x \geq 0$$

Worked example	Your turn
Show that the function is convex for all real values of x: $f(x) = e^{3x} + x^2$ $g(x) = e^{4x} + x^4$	Show that the function is convex for all real values of x: $h(x) = e^{2x} + x^2$ Shown that $h''(x) \geq 0$ for $x \in \mathbb{R}$

Worked example	Your turn
Determine if there is a point of inflection on the curve with equation $y = (x-3)^4$	Determine if there is a point of inflection on the curve with equation $y = (x+5)^4$ No $\frac{d^2y}{dx^2} = 12(x+5)^2 \geq 0$ Either side of $x = -5$, $\frac{d^2y}{dx^2}$ always positive. Therefore local minimum at $(-5, 0)$

Worked example

A curve C has equation

$$y = \frac{1}{4}x^2 \ln x - 3x + 7, x > 0$$

Find where C is convex

Your turn

A curve C has equation

$$y = \frac{1}{5}x^2 \ln x + 4x - 3, x > 0$$

Find where C is convex

$$x \geq e^{-\frac{3}{2}}$$