

Stationary Points



i. The curve C has equation

$$f(x) = 8x - x^2$$

- Find the co-ordinates of the stationary points of C .
- Is this stationary point a maximum or a minimum?

- ii.**
- Calculate $f'(x)$ for the function $f(x) = x^3 + 2x^2 - 5$.
 - Hence, calculate $f''(x)$.
 - Find the values of x where $f(x)$ is stationary.
 - Determine whether each stationary point is a minimum or a maximum.

iii. The curve C has equation:

$$y = 2x^3 - 5x^2 - 4x + 2$$

- Find $\frac{dy}{dx}$.
- Use the result from above, find the coordinates of the turning points of C .
- Find $\frac{d^2y}{dx^2}$.
- Hence, or otherwise, determine the nature of the turning points of C .

iv. An oil drum has length x cm. The ends are circles with radii r cm each, with $r > 0$. The capacity of the barrel is 100cm^3 .

- The drum is made out of metal. Show that the amount of metal needed to produce the barrel (its surface area) is given by:

$$A = 2\pi r^2 + \frac{200}{r}$$

- Use calculus to find the value of r for which A is maximised.
- What is the maximum area of metal needed to produce the drum?

