

Quadratics - Q1 [Practice/E] (16/6/21)

Find the turning points of the following quadratic functions
(without differentiating)

(i) $y = x^2 + x - 2$

(ii) $s = 10t - 5t^2$

(iii) $s = 1 + 10t - 5t^2$

Solution

(i) Obtain roots from $x^2 + x - 2 = (x + 2)(x - 1)$

Then minimum point from either $x = \frac{1}{2}(-2 + 1)$, or completing the square: $x^2 + x - 2 = \left(x + \frac{1}{2}\right)^2 - \frac{1}{4} - 2$, to give $\left(-\frac{1}{2}, -\frac{9}{4}\right)$.

(ii) Roots of 0 & 2; so maximum point when $t = 1$, to give (1,5); or completing the square:

$$10t - 5t^2 = -5(t^2 - 2t) = -5(t - 1)^2 + 5$$

(iii) Alternative to above approach: maximum point when $t = 1$, as graph from (ii) is translated by $\begin{pmatrix} 0 \\ 1 \end{pmatrix}$, to give (1,6).