28. (a) Using the work-kinetic energy theorem

$$K_f = K_i + \int_0^2 \left(2.5 - x^2\right) dx = 0 + (2.5)(2) - \frac{1}{3}(2)^3$$

we obtain $K_f = 2.3$ J.

(b) For a variable end-point, we have K_f as a function of x, which could be differentiated to find the extremum value, but we recognize that this is equivalent to solving $F = 0$ for x:

$$F = 0 \implies 2.5 - x^2 = 0$$

Thus, K is extremized at $x = \sqrt{2.5}$ and we compute

$$K_f = K_i + \int_0^{\sqrt{2.5}} \left(2.5 - x^2\right) dx = 0 + (2.5)(\sqrt{2.5}) - \frac{1}{3}(\sqrt{2.5})^3 .$$

Therefore, $K = 2.6$ J at $x = \sqrt{2.5} = 1.6$ m. Recalling our answer for part (a), it is clear that this extreme value is a maximum.