A particle travels with velocity $v(t) = 36 - 24t + 3t^2$. What is the displacement between $t = 0$ and $t = 10$? What is the distance travelled by the particle?

Solution:

$$\frac{dS(t)}{dt} = v(t)$$

$$S(t) = \int v(t)dt$$

$$S(t) = \int_0^{10} (36 - 24t + 3t^2)dt = (36t - 12t^2 + t^3)\,|_0^{10} = 360 - 120 + 1000 = 1240$$

Answer: Displacement and distance equal 1240