Answer on Question #72177 Physics / Other

A space ship of mass $m = 50000$ kg is traveling at a speed of $v_i = 11500$ m/s in outer space. Except for the force generated by its own engine, no other force acts on the ship. As the engine exerts a constant force of $F = 400000$ N, The ship moves a distance of $d = 2500000$ m in the direction of the force of the engine. Determine the final speed of the ship.

Solution:

The distance

$$d = \frac{v_f^2 - v_i^2}{2a}$$

So, the final velocity

$$v_f = \sqrt{v_i^2 + 2ad}$$

From the Newton's second law

$$F = ma$$

we obtain the acceleration

$$a = \frac{F}{m}.$$

Finally

$$v_f = \sqrt{v_i^2 + \frac{2Fd}{m}}$$

$$v_f = \sqrt{11500^2 + \frac{2 \times 400000 \times 2500000}{50000}} = 13124\,\frac{\mathrm{m}}{\mathrm{s}}$$

Answer: $13124\,\frac{\mathrm{m}}{\mathrm{s}}$