

Question 30462

The car is moving with negative acceleration. Hence, the law for speed as a function of time is $v(t) = v_0 - at$, where v_0 is initial velocity, and a is acceleration.

According to 2nd Newton's law, acceleration is connected with force exerted on body by $a = \frac{F}{m}$.

Hence, law of motion in terms of force is $v(t) = v_0 - \frac{F}{m}t$. At the moment of stop $v = 0 \frac{m}{s}$ and time is $t = 10 s$. Plugging these values into latter formula, obtain force applied by the brakes:

$$0 = 15 - \frac{F}{m} \cdot t \Rightarrow F = v_0 \frac{m}{t} = \frac{15 \frac{m}{s}}{10 \frac{m}{s}} \cdot 480 \text{ kg} = 720 \text{ N}.$$