Answer on Question #49238-Physics-Mechanics-Kinematics-Dynamics

A car of mass m starts from rest and accelerates so that the instantaneous power delivered to the car has a constant magnitude P. The instantaneous velocity of this car is proportional to

(1) $t^2 P$

(2) $t^{\frac{1}{2}}$

(3) $t^{-\frac{1}{2}}$

(4) $\dfrac{t}{m^{\frac{1}{2}}}$

Solution

$$P = Fv = \left(m \frac{dv}{dt} \right) v = mv \frac{dv}{dt}$$

$$\int P dt = \int mv \, dv$$

$$Pt = \frac{mv^2}{2} \rightarrow v = \sqrt{\frac{2Pt}{m}}$$

$$\therefore v \propto t^{\frac{1}{2}}$$

Answer: (2) $t^{\frac{1}{2}}$.