9.62 A team of dogs accelerates a 200 kg dogsled from 0 to 5.0 m/s in 3.0 s. Assume that the acceleration is constant.
(a) What is the magnitude of the force exerted by the dogs on the sled?
(b) What is the work done by the dogs on the sled in the 3.0 s?
(c) What is the instantaneous power of the dogs at the end of the 3.0 s?
(d) What is their instantaneous power at 1.5 s?

(a) Ignoring friction

$$F_{pull} = m a_x$$

$$v_f = v_i + a_x t \Rightarrow a_x = \left(\frac{v_f - v_i}{t}\right) = \frac{5\,m/s}{3\,s} = \frac{5}{3}\,m/s^2$$

$$\Rightarrow F_{pull} = (200\,kg)\left(\frac{5}{3}\,m/s^2\right) = 333\,N$$

(b)
$$W = \frac{1}{2}\Delta K = \frac{1}{2} m v_f^2 = \frac{1}{2}(200\,kg)(5\,m/s)^2$$
$$= 2500\,J$$

(c) $$P = F_x v_x = (333\,N)(5\,m/s) = 1.7 \times 10^3\,W$$

(d)
$$v_f = v_i + a_x t$$
$$= 0 + \left(\frac{5}{3}\,m/s^2\right)(1.5\,s)$$
$$= 2.5\,m/s$$

$$P = F_x v_x = (333\,N)(2.5\,m/s)$$
$$= 8.3 \times 10^2\,W$$