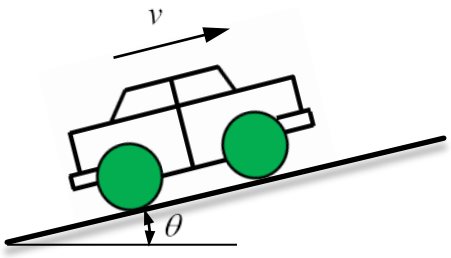
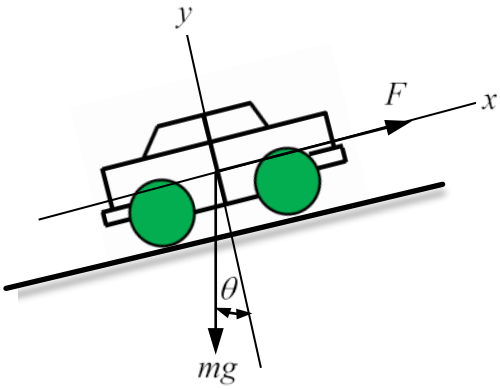
2-31. A 2000-kg car travels up a $\theta = 5^\circ$ slope. If the constant velocity of the car is normally distributed $v \sim (10, 1^2)$ m/s, determine the power developed by the engine if the car has an efficiency of $\varepsilon = 0.75$.





$$F = mg\sin\theta$$

$$P = Fv = mg\sin\theta v$$

$$P_{engine} = \frac{P}{\varepsilon} = \frac{mg\sin\theta v}{\varepsilon}$$

$$\mu_{P_{engine}} = \frac{mg\sin\theta\mu_v}{\varepsilon} = \frac{2000(9.81)\sin 5^\circ(10)}{0.75} = 22.80 \text{ kW}$$

$$\sigma_{P_{engine}} = \frac{mg\sin\theta\sigma_v}{\varepsilon} = \frac{2000(9.81)\sin 5^\circ(1)}{0.75} = 2.28 \text{ kW}$$

Therefore, $P_{engine} \sim N(22.80, 2.28^2)$ kW. **Ans.**