p. 281 Dr. Bob

1.

$m = 81 kg$

$V = 50 \frac{km}{h}\left(\frac{1000 m}{1 km}\right)\left(\frac{1 h}{3600 s}\right) = 13.9 m/s$

$r = 22 m$

$F_c = m\frac{v^2}{r} = (81 kg)\frac{(13.9 m/s)}{22 m}$

$\boxed{F_c = 710 N}$ Friction of blades on ice

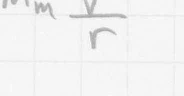
2.

$v = 8.0 m/s$ $m = 40 kg$
$r = 3.2 m$

$F_c = m\frac{v^2}{r} = (40 kg)\frac{(8.0 m/s)^2}{3.2 m}$

$F_c = 800 N$ Provided by tension in the chain.

3.



$v = 19,481 m/s$ $m_s = 5.69 \times 10^{26} kg$

The centripetal force is due to gravity.

$F_g = G\frac{m_1 m_2}{r^2}$

$F_c = m_m\frac{v^2}{r}$

m_s – mass of saturn
m_m – mass of satellite (moon)

$F_g = F_c$ $G\frac{m_m m_s}{r^2} = m_m\frac{v^2}{r}$

$G\frac{m_s}{r} = v^2$

$r = \frac{G m_s}{v^2} = 6.67 \times 10^{-11}\frac{N \cdot m^2}{kg^2}\left(\frac{5.69 \times 10^{26} kg}{(19481 m/s)^2}\right)$

$$\boxed{r = 1.0 \times 10^8 \text{ m}}$$

Units $\frac{N \cdot \cancel{m^2}}{kg^2} \; \frac{\cancel{kg}}{\cancel{m^2}/s^2}$

$$= \frac{N}{kg/s^2} = \frac{\cancel{kg}\, m/\cancel{s^2}}{\cancel{kg}/\cancel{s^2}} = m \checkmark$$