Newton's Laws with Friction - 1

Car on speedway (1):

$$a_x = \frac{v^2}{r}\,, \quad a_x \cos(\theta) = g \sin(\theta)\,.$$

Frictional force (2):

$$\mu_k\, g = a\,, \quad a = \frac{v}{t}\,, \quad d = \frac{a}{2}\, t^2\,.$$

Inclined plane (4). Force due to friction:

$$F_\mu = \mu\, W \cos(\theta)\,.$$

Up an inclined plane with friction (5).
Distance:

$$v = v_0 - a\,t\,, \quad a = g \sin(\theta) + \mu_k\, g \cos(\theta)\,, \quad d = \frac{v_0}{2}\, t\,.$$

Angle for minimized distance:

$$0 = \frac{d}{d\theta}\, \frac{const}{f(\theta)} = -\frac{const}{f^2}\, \frac{df}{d\theta}\,.$$

Newton's Laws with Friction - 2

Moving an Iceblock (6).

Maximum speed:

$$F_x^{\text{min}} = F^{\text{min}} \cos(\theta)\,, \quad F_y^{\text{min}} = F^{\text{min}}\, sin(\theta)$$

$$F_x^{\text{min}} = F^{\text{min}} \cos(\theta) = \mu_s \,(\ \ ?\ \ )\,.$$

Minimization then similar as in previous problem.

Gravity Pulling Blocks (7):

$$M_2\,(g - a) = M_1\,(\ \ ?\ \ )\,.$$