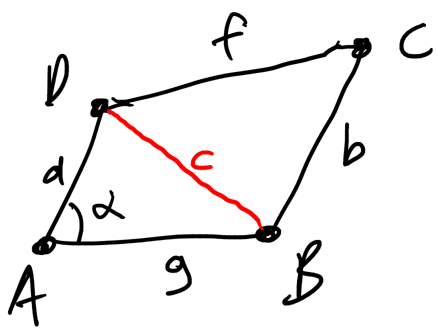
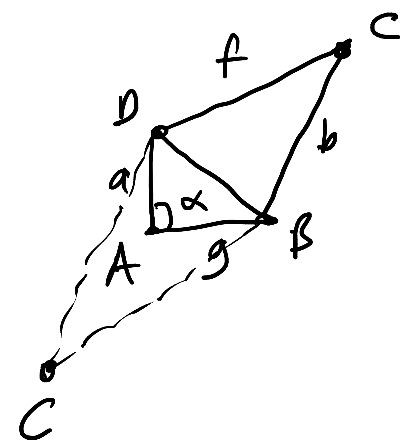
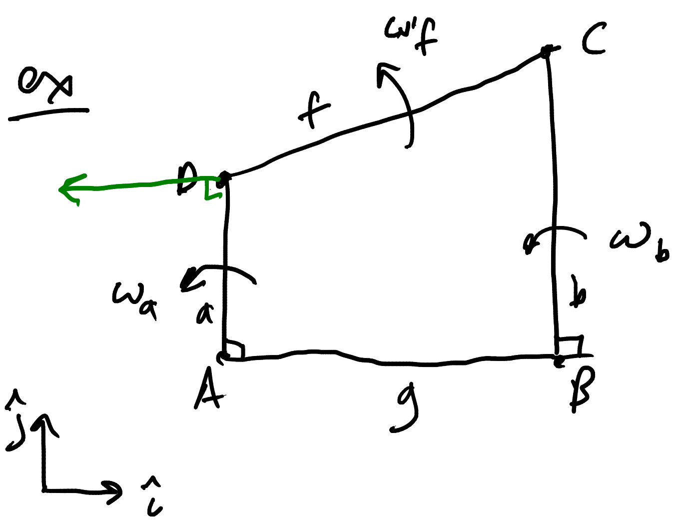
Four-bar linkages – one degree of freedom system

c fully constrains truss.





ex



unknowns

Given ω_a, find ω_b, ω_f.

Get to C in two different ways.

$$\vec{V}_D = \vec{V}_A + \vec{\omega}_a \times \vec{r}_{AD}$$

$$= 0 + \omega_a \hat{k} \times a\hat{j}$$

$$= -\omega_a a \hat{i}$$

$$\vec{V}_c = \vec{V}_D + \vec{\omega}_f \times \vec{r}_{DC}$$

$$= -\omega_a a \hat{i} + \omega_f \hat{k} \times (g\hat{i} + (b-a)\hat{j})$$

$$= -\omega_a a\hat{\imath} - \omega_f(b-a)\hat{\imath} + \omega_f g\hat{\jmath}$$

$$= -(\omega_a a + \omega_f(b-a))\hat{\imath} + \omega_f g\hat{\jmath}$$

equal

$$\vec{V}_c = \vec{V}_B + \vec{\omega}_b \times \vec{r}_{BC}$$

one vector eqn
= 2 scalar eqns

$$= -\omega_b b\hat{\imath}$$

$\hat{\imath}$ component: $\omega_b b = \omega_a a + \omega_f(b-a)$

$\hat{\jmath}$ component: $\omega_f g = 0 \Rightarrow$ $\boxed{\begin{array}{l}\omega_f = 0 \\ \omega_b = \frac{a}{b}\omega_a\end{array}}$