

Example 17

$$(a) \quad 25^2 = 30^2 + 25^2 - 2(30)(25) \cos \angle ADC$$

$$\cos \angle ADC = \frac{3}{5}$$

$$\angle ADC \approx 53.1^\circ$$

$$DF = 30 \cos \angle ADC = 18$$

$$28^2 = 25^2 + 40^2 - 2(25)(40) \cos \angle ADB$$

$$\angle ADB \approx 43.9^\circ$$

$$BF^2 = 40^2 + 18^2 - 2(40)(18) \cos \angle ADB$$

$$BF \approx 29.8$$

$$40^2 = 18^2 + BF^2 - 2(18)(BF) \cos \angle BFD$$

$$\angle BFD \approx 111^\circ$$

(b) Let G be a point on BD such that $FG \perp AD$.

Required angle is $\angle CFG$.

$$CF = \sqrt{30^2 - 18^2} = 24$$

$$FG = 18 \tan \angle ADB \approx 17.3$$

$$DG = \sqrt{18^2 + FG^2} \approx 25.0$$

$$40^2 = 40^2 + 30^2 - 2(40)(30) \cos \angle BDC$$

$$\angle BDC \approx 68.0^\circ$$

$$CG^2 = DG^2 + 30^2 - 2(DG)(30) \cos \angle BDC$$

$$CG \approx 31.0$$

$$CG^2 = FC^2 + FG^2 - 2(FC)(FG) \cos \angle CFG$$

$$\angle CFG \approx 95.9^\circ$$