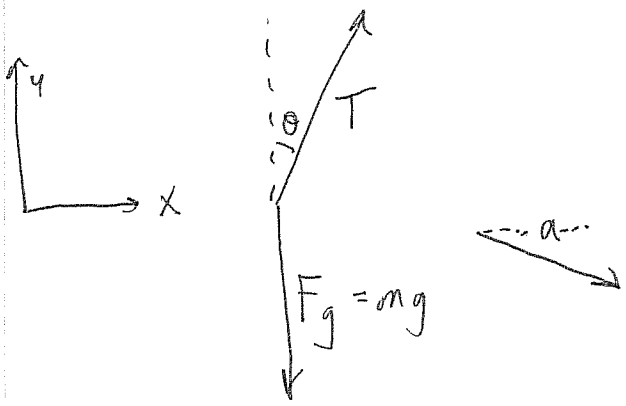
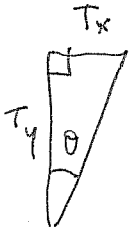
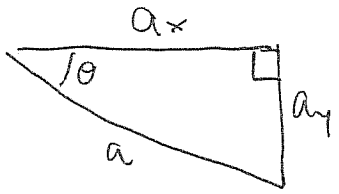
Summer 2010 PH4131 Midterm Free-form Part B.



$v = 0$, so $a_c = 0$

$\Rightarrow$ acceleration is tangential only.





$a_x = a\cos\theta$

$a_y = -a\sin\theta$

	x	y
T	$T\sin\theta$	$T\cos\theta$
F_g	0	$-mg$
	$(F_{Net})_x = T\sin\theta$	$(F_{Net})_y = T\cos\theta - mg$.

Newton's 2nd Law x-component: $(F_{Net})_x = ma_x$

$T\sin\theta = ma\cos\theta$

$\Rightarrow a = \dfrac{T\sin\theta}{m\cos\theta}$

Newton's 2nd Law y-component: $(F_{Net})_y = ma_y$

$T\cos\theta - mg = -ma\sin\theta$

$T\cos\theta - mg = -m\sin\theta\left[\dfrac{T\sin\theta}{m\cos\theta}\right]$

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$$T m \cos^2\theta - m^2 g \cos\theta = -T m \sin^2\theta$$

$$T m \left[\underbrace{\cos^2\theta + \sin^2\theta}_{=1} \right] = m^2 g \cos\theta$$

$$T = m g \cos\theta$$

$$= (82)(9.8)\cos 32$$

$$\boxed{T = 680\,N}$$