Physics 2110
Autumn 1998
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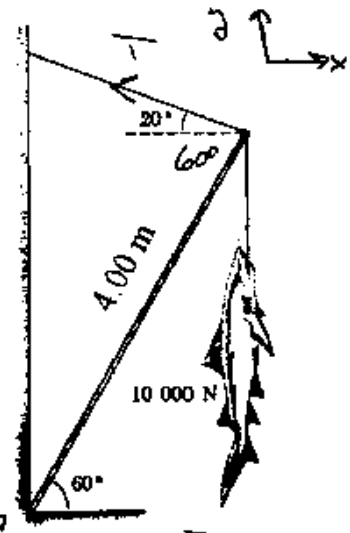
EXAM 3

3

Name:_____ Social Security #:_____

TA (circle one): Gary Samuelson Mitchell McKain Pierre Lacock

A 1.00×10^4 N great white shark is hanging by a cable attached to a 4.00 m massless rod that can pivot at its base. See figure.



A. (12 PTS) Determine the tension in the cable supporting the upper end of the rod.

STATIC EQUIL — FIGURE

$\Sigma F_{x\,EXT} = 0 \rightarrow F_x - T\cos 20^\circ = 0$

$\Sigma F_{y\,EXT} = 0 \rightarrow F_y + T\sin 20^\circ - W = 0$

$\Sigma \tau_{EXT} = 0 \rightarrow r_{T\perp} T - r_{W\perp} W = 0$

$(l_{ROD}\sin 80^\circ)T - (l_{ROD}\sin 30^\circ)W = 0$

$T = \dfrac{W\sin 30^\circ}{\sin 80^\circ} = \boxed{5080\,N}$

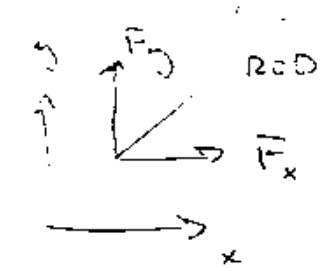
SELECT BASE AS AXIS

CALL F_x = X COMP OF FORCE ON BASE OR ROD

F_y = y COMP.

B. (23 PTS) Determine the force (a vector quantity) exerted on the base of the rod. Suggestion: Find this force by first evaluating the separate components of the force. SEE FIGURE

AT BASE



$F_x = T\cos 20^\circ = (5080\,N)\cos 20^\circ$

$\boxed{F_x = 4770\,N}$ (6 PTS)

$F_y = W - T\sin 20^\circ$

$= 10^4\,N - (5080\,N)\sin 20$

$\boxed{F_y = 8260\,N}$ (10 PTS)

$\boxed{\vec{F} = F_x\hat{i} + F_y\hat{j} = (4770\,N)\hat{i} + (8260\,N)\hat{j}}$ (7 PTS)