

## FOURTH MIDTERM

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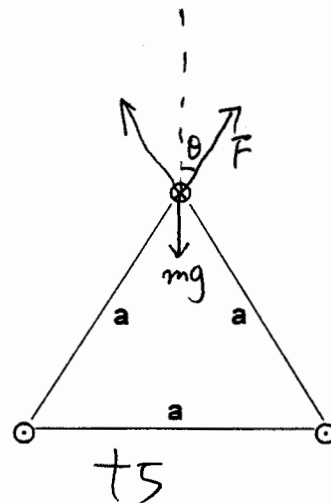
**SHOW ALL WORK!!!!**

**REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!**

**Use the conversion constants and data given on the front page.**

Three very long wires are arranged in the configuration shown. The two lower wires are fixed in position and carry identical currents out of the paper. The upper wire has a mass density of 2.50 kg/m. It has the same current as the lower wires, but in the opposite direction. Calculate the magnitude of the current  $I$  that will support the upper wire in the position shown.

⊙ means out of and ⊗ means into the paper. ( $a = 10.0$  cm)



$$F = \frac{\mu_0 I^2 l}{2\pi a} + 5$$

$$\sum F_x = 0 \Rightarrow 2 \cos \theta \cdot \frac{\mu_0 I^2 l}{2\pi a} = \lambda g l$$

$$I^2 = \frac{\lambda g \pi a}{\mu_0 \cos \theta} + 10$$

$$I = 2.66 \times 10^3 \text{ A} + 5$$