2012 F=ma Exam: Problem 11

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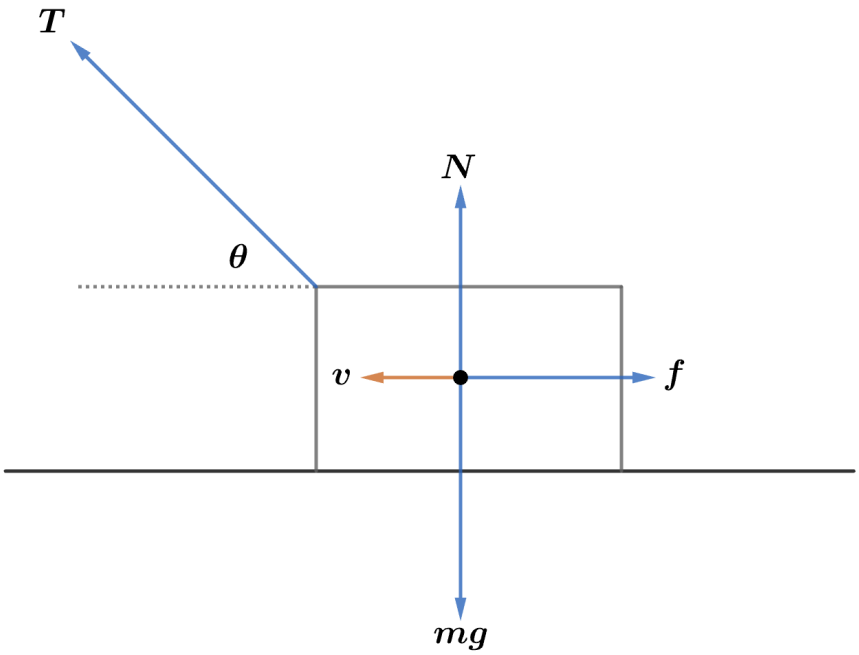

Since the box is moving at constant velocity, we balance forces in the vertical direction and horizontal direction:

$$T\sin\theta + N = mg$$
$$T\cos\theta = f$$

When the block is far away, $\theta \to 0$ so we have

$$N = mg$$
$$T = f = \mu mg$$

When the block is close to the pulley, $\theta \to \pi/2$ so we have

$$T + N = mg$$
$$0 = f$$

Since $f = 0$,

$$N = 0$$
$$T = mg$$

We now go through the possible choices:

- A) Not correct since T changes from μmg to mg.
- B) Correct since f decreases from μmg to 0.
- C) Not correct since N decreases from mg to 0.
- D) Not correct for the same reason as C.
- E) Not correct for the same reason as C.

so the answer is $\boxed{\text{B}}$.