2015 F=ma Exam: Problem 4

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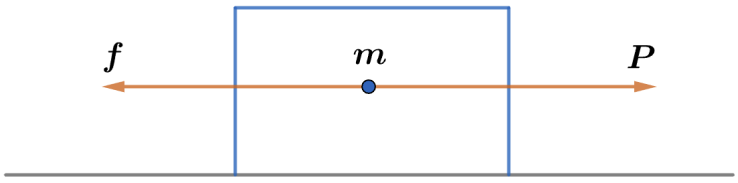


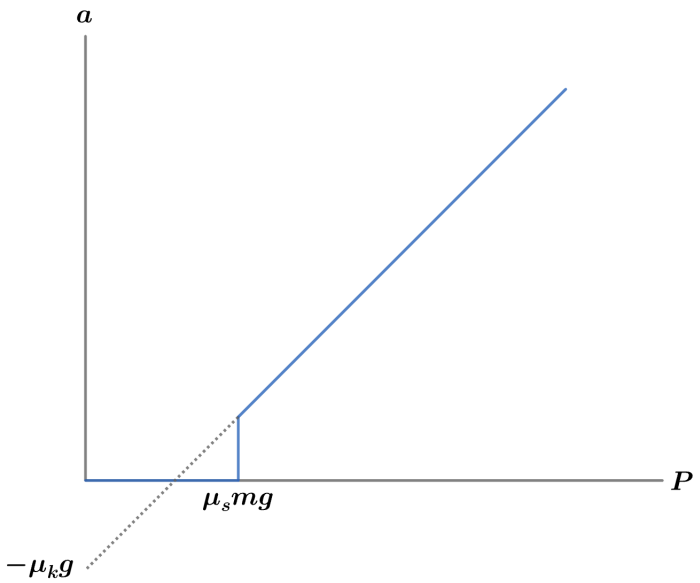
For small P, the force of static friction $f = P$ balances the external force so $a = 0$. This occurs up to the maximum force supplied by static friction $f_{\max} = \mu_s mg$. Once $P \geq \mu_s mg$, we apply Newton's 2nd law to obtain

$$P - f = ma$$

Since we have kinetic friction, $f = \mu_k mg$ so

$$P - \mu_k mg = ma$$
$$a = \frac{P}{m} - \mu_k g$$

which in an a-P plot is a line with slope $1/m$ and intercept $-\mu_k g$.



Thus, the answer is $\boxed{\text{A}}$.