USEFUL INFORMATION:

**Basic Relationships:**
- \( F = ma \) (force law)
- \( KE = \frac{1}{2} mv^2 \) (kinetic energy)
- \( PE_g = mgh \) (Gravitational potential energy near the earth)
- \( F = G \frac{mm'}{R^2} \) (General Gravitational force law)

**Phenomenological Approximations:**
- \( F_f = \mu F_n \)

**Mathematical Consequences of Assumed Values:**

\[
\begin{align*}
  v &= v_o + at \\
  x &= v_o t + \frac{1}{2} at^2 \\
  v^2 &= v_o^2 + 2ax
\end{align*}
\]

Circular Motion: \( a = \frac{v^2}{R} \) (centripetal acceleration)

\[
\begin{align*}
  \theta &= s/R \\
  \omega &= v/R \\
  \alpha &= a/R \\
\end{align*}
\]

**Constants**
- \( g = 9.8 \text{ m/s}^2 \approx 10 \text{ m/s}^2 \) (sufficient accuracy for all problems here)
- \( G = 6.68 \times 10^{-11} \text{ N-m}^2/\text{kg}^2 \)