3. A projectile starting with a potential energy, \( PE_G = 10 \) Joules, is fired straight upward with a kinetic energy, \( KE = 50 \) Joules. When the projectile has potential energy, \( PE_G = 30 \) Joules, what is the kinetic energy of the projectile?

The only force acting is gravity and therefore, energy is conserved.

\[
KE_0 + PE_0 = KE + PE \\
(50 \text{ J}) + (10 \text{ J}) = KE + (30 \text{ J}) \\
KE = 30 \text{ J}
\]

a) 20 Joules  
* b) 30 Joules 
 c) 40 Joules 
 d) 60 Joules 
 e) 80 Joules

4. A spring fires a projectile, with mass \( m \), straight up into the air. What is the magnitude of the net force acting on the mass at its highest point.

Throughout the flight of the projectile, the only force acting is gravity, \( F_G = mg \). At the highest point, \( v \) is zero, but the net force is still \( F_G \). At that point, gravity changes the object's direction from up to down.

* a) \( mg \)  
 b) \( 2mg \)  
 c) zero  
 d) \( 1/2mg^2 \)  
 e) \( kx \)