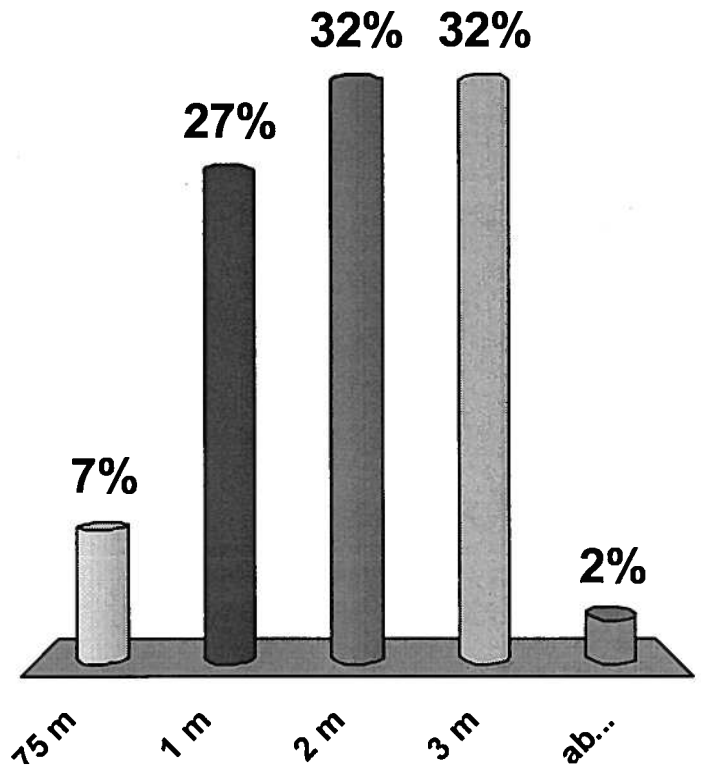
**A mass, M=02.0 kg, attached to a spring of stiffness, k = 2.0 N/m, has a maximum speed of 3.0 m/s as it passes through its equilibrium point. How far is it from the equilibrium point when it comes momentarily to rest and begins moving in the opposite direction?**

a) 0.75 m
b) 1 m
c) 2 m
d) 3 m
e) None of the above is within 10%



# The correct answer is:

## d) $x_f$ = 3.0 m, as follows,

- Use Conservation of ME to write:
- $(ME)_i = (KE)_i + (PE)_i = (KE)_f + (PE)_f = (ME)_f$ ; Eq.(1);
  Then $(PE)_{Spring} = \frac{1}{2}kx^2$ yields
  $(PE)_i = 0$, at $x_i = 0$ and
  $(PE)_f = \frac{1}{2}kx_f^2$ , at $x = x_f$ .
  Also $(KE)_i = \frac{1}{2}Mv_i^2 = \frac{1}{2}(2.0)(3.0)^2 = 9.0$ J and
  $(KE)_f = 0$, since v= 0 at turning point.
  Thus, Eq (1) becomes
  $\frac{1}{2}Mv_i^2 + 0 = 0 + \frac{1}{2}kx_f^2$ , so that
  $x_f = \{Mv_i^2/k\}^{1/2} = \{(18.0\ J)/(2.0\ J/m^2)\}^{1/2} = 3$ m (d)