BE #3.

The first question (potential energy diagram) is on the problem set. Please see solutions there.

2. An object starts at 10 m and has a velocity of $v(t) = 6\ m/s - 4\ m/s^2(t) + 3\ m/s^3(t^2)$. Find the acceleration, velocity, and position at 3 seconds.

For v we can plug and chug

$v(3) = 6\frac{m}{s} - 4\frac{m}{s^2} \cdot 3s + 3\frac{m}{s^3} \cdot 9s^2 = 6\frac{m}{s} - 12\frac{m}{s} + 27\frac{m}{s} = 21\frac{m}{s}$ ✓

I use a kinematics lens because this problem is exclusively about motion as an explicit function of time.

$a = \frac{dv}{dt}$ ∴

diagram? ☹ but limited time, I understand.

$a(t) = -4\frac{m}{s^2} + 3\frac{m}{s^3}t$

$a(3) = -4\frac{m}{s^2} + 18\frac{m}{s^2} = 14\frac{m}{s^2}$ ✓

$x(t) = \int v\,dt$ + initial pos

$\therefore x(t) = \int 6\frac{m}{s} - 4\frac{m}{s^2}t + 3\frac{m}{s^3}t^2\,dt + 10\,m$

$x(3) = 6\frac{m}{s} \cdot 3s - \frac{4}{2}\frac{m}{s^2} \cdot 9s^2 + 1\frac{m}{s^3} \cdot 27s^3 + 10\,m$

$= 18\,m - 18m + 27m + 10\,m = 37\,m$ ✓