6-8)

$$U(r) = C \left(\frac{r_o^{12}}{r^{12}} - 2 \frac{r_o^6}{r^6} \right)$$

a)

$$F(x) = -\frac{dU}{dr} = 12C \left(\frac{r_o^{12}}{r^{13}} - \frac{r_o^6}{r^7} \right)$$

b)

$$F(r_o) = 12C \left(\frac{r_o^{12}}{r_o^{13}} - \frac{r_o^6}{r_o^7} \right) = \frac{12C}{r_o} \left(\frac{r_o^{12}}{r_o^{12}} - \frac{r_o^6}{r_o^6} \right) = 0 \ .$$

c)

We need to see the <u>sign</u> of the force. Let $z = r_o/r$.

$$F(z) = \frac{12C}{r} (z^{12} - z^6) = \frac{12Cz^6}{r} (z^6 - 1)$$

When $z = 1$ ($r = r_o$), the force is zero.

When z is larger than 1 ($r < r_o$), $z^6 > 1$, and the force is positive, or toward larger r, or repulsive.

When z is smaller than 1 ($r > r_o$), $z^6 < 1$, and the force is negative, or toward smaller r, or attractive.