10. There is no equilibrium position for q_3 *between* the two fixed charges, because it is being pulled by one and pushed by the other (since q_1 and q_2 have different signs); in this region this means the two force arrows on q_3 are in the same direction and cannot cancel. It should also be clear that off-axis (with the axis defined as that which passes through the two fixed charges) there are no equilibrium positions. On the semi-infinite region of the axis which is nearest q_2 and furthest from q_1 an equilibrium position for q_3 cannot be found because $|q_1| < |q_2|$ and the magnitude of force exerted by q_2 is everywhere (in that region) stronger than that exerted by q_1 on q_3. Thus, we must look in the semi-infinite region of the axis which is nearest q_1 and furthest from q_2, where the net force on q_3 has magnitude

$$\left| k\frac{|q_1 q_3|}{x^2} - k\frac{|q_2 q_3|}{(d+x)^2} \right|$$

with $d = 10$ cm and x assumed positive. We set this equal to zero, as required by the problem, and cancel k and q_3. Thus, we obtain

$$\frac{|q_1|}{x^2} - \frac{|q_2|}{(d+x)^2} = 0 \implies \left(\frac{d+x}{x}\right)^2 = \left|\frac{q_2}{q_1}\right| = 3$$

which yields (after taking the square root)

$$\frac{d+x}{x} = \sqrt{3} \implies x = \frac{d}{\sqrt{3}-1} \approx 14 \text{ cm}$$

for the distance between q_3 and q_1, so $x + d$ (the distance between q_2 and q_3) is approximately 24 cm.