10.1)

b) NO, none of these filters are linear. This is because all the given filters are iirs

c) There is no absolute better filter but the quantity of our interest defines which is better for us.

Based on response containing ripples, width of the transition band or more stable outputs in time domain we select the filter

Butterworth filter has a nearly linear phase in the pass band. Also it has less overshoot.

If we want sharp transition from pass band to stop band Chebyshev is better/

Elliptical filters are used when the cutoff frequencies have to be very precise.

10.2)

b) Yes this filter is stable. Condition for stability is including the unit circle which happens here so the filter is stable.

c) As r0 increases values we notice that the values near peak come closer and the line almost becomes like delta where value at that point is high and the other points have smaller values.