Assignment No 2

Highway Engineering

1) Consider Example 3.4. Solve this problem with the parabolic equation (Eq. 3.1) rather than by using offsets.
2) An existing highway-railway at-grade crossing is being redesigned as grade separated to improve traffic operations. The railway must remain at the same elevation. The highway is being reconstructed to travel under the railway. The underpass will be a sag curve that connects to 2.25% tangent sections on both ends, and the PVI will be centered under the railway (a symmetrical alignment). The sag curve design speed is 45 mi/h. How many feet below the railway should the curve PVI be located?
3) You are asked to design a horizontal curve for a two-lane road. The road has 12-ft lanes. Due to expensive excavation, it is determined that a maximum of 34 ft can be cleared from the road's centerline toward the inside lane to provide for stopping sight distance. Also, local guidelines dictate a maximum superelevation of 0.08 ft/ft. What is the highest possible design speed for this curve?
4) A section of highway has vertical and horizontal curves with the same design speed. A vertical curve on this highway connects a +1% and a +3% grade and is 420 ft long. If a horizontal curve on this highway is on a two-lane section with 12-ft lanes and has a central angle of 37 degrees and a superelevation of 6%, what is the length of the horizontal curve?
5) Two straight sections of freeway cross at a right angle. At the point of crossing, the east-west highway is at elevation 150 ft and has a constant +5.0% grade (upgrade in the east direction), and the north-south highway is at elevation 125 ft and has a constant 3.0% grade (downgrade in the north direction). Design a 90- degree ramp that connects the northbound direction of travel to the eastbound direction of travel. Design the ramp for the highest design speed (to nearest 5 mi/h) with the constraint that the minimum allowable value of D is 8.0. (Assume that the PC of the horizontal curve is at station 15 + 00, and the vertical curve PVIs are at the PC and PT.) Give the stationing and elevations of the PC, PT, PVCs, and PVTs.