# Assignment 4 Switchback

You are pegging in a route on a contour map. The grade line you are using is 10%. You switch back and continue. To get ready for the field you want to calculate the average grade through the switchback.

Case A:

Center of radius at gradeline switchback point. Assuming you run the tangents back from the PC/PT until it connects with the gradeline, what will be the average grade through the switchback?

**Radius= 60 ft, Grade 10%, Delta = 180°**
**The elevation gap between PC and PT is almost 38 feet**
**L=πR= 60π= 188.4feet, the distance from PC to gradeline is 150 feet, the distance from PT to gradeline is 170 feet. The total length of switchback is 188.4+150+170= 508.4feet.**
**Grade is 38/508.4= 7.5%**

Case 2:

How far do you have to move the center of the curve out such that the average grade through the SW will be 7% or less.

Since we will not change the radius, we will need to increase the two side distances (PC and PT to gradeline). Once we need the grade less than 7%, the total length need to be bigger than **542.86 feet**. The L (PC to PT) will not be change, so the other length needs to be larger than **542.86-188.4= 354.46 feet**.

Orginally, the distance of two sides are 320 feet, the center need to be moved in **(354.46-320)/2= 17.23** feet at least

# St_Ed Road Project