Name: _____   **Surface Color:** _____

Task Master: _____   **Cynic:** _____   **Recorder:** _____

MTH 254   **THE ROLLER COASTER**   Summer 2015

*Working in small groups (3 or 4 people), solve as many of the problems below as possible. Try to resolve questions within the group before asking for help. Each group member should then write up the solutions in their own words; please do not use this sheet for that purpose, but **please turn in this sheet as well**. Show your work! Full credit will only be given if your answer is supported by calculations and/or explanations as appropriate.*

On your Mark: Six Flags Amusement Parks has hired your team to analyze their newest roller coaster. They aren't able to tell you the ride's actual path, but they can tell you the surface (in space) on which the path rides. To simulate their newest ride, they've asked you to complete the following steps:

1. Draw a *big, smooth (interesting)* ride on your contour map around the green triangle and the red star.

2. Use a ∘ to label where your curve is parallel to the level curves.

3. Use a × to label where your curve is perpendicular to the level curves.

4. Transfer your ride's path onto the surface.

Get Set: Mark the locations of every peak and every valley on the ride on both the contour plot and the surface.

Go: Six Flags would like at least three ways to identify the peaks and valleys in their ride. Decide whether the peaks and valleys can be found with a relationship between each pair of quantities listed below. If it is possible, give the condition.

1. The level curves of the surface and the ride's path.

2. The gradient of the height of the surface and the ride's path.

3. The level curves of the surface and the normal vector to the ride's path.

4. The gradient of the height of the surface and the normal vector to the ride's path.