Steps to Draw Pump Impeller: The steps below show one way to draw the impeller. You should make sure that your impeller is not larger than the one shown or it may not fit in the pump housing.

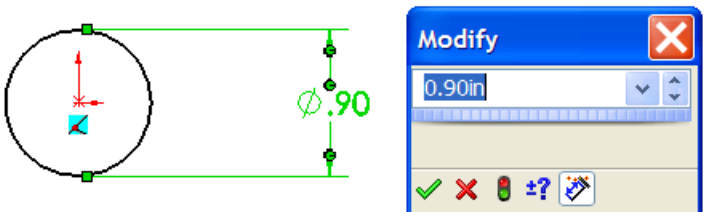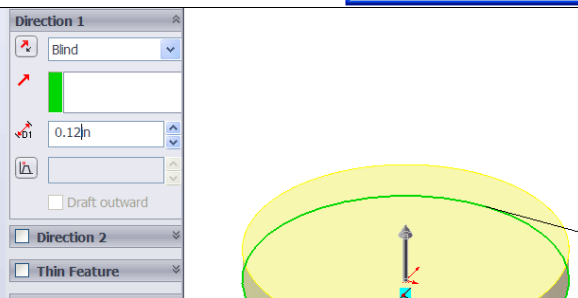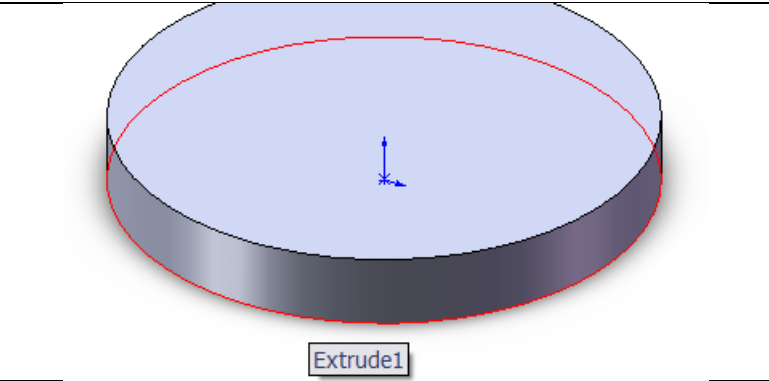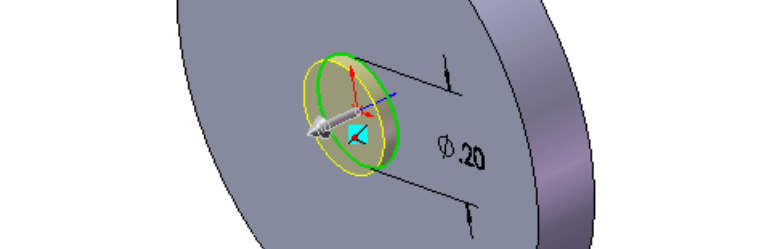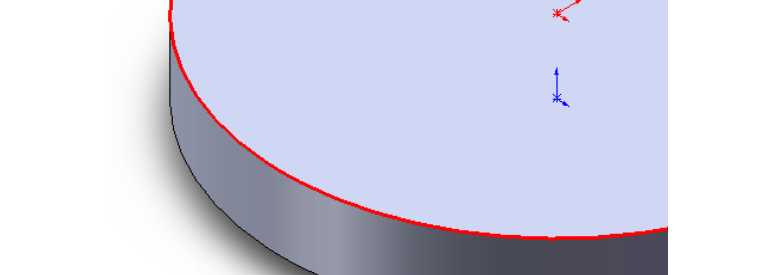|		
1. Change units to inches: Tools > Options > Document Properties > Units and then select: IPS (inch, pound, second)		
2. Select Extruded Boss / Base from the Features toolbar		
3. Select the Top Plane for drawing.		
4. Select Circle from the Sketch toolbar. Now position the pointer over the origin, and draw a circle with a diameter of approximately 0.9 inches.		
5. Select Smart Dimension from the Sketch toolbar, and set the diameter of the circle to 0.9 inches.		
6. Return and extrude the circle to a height of 0.12 inches. Then click the green check mark to accept this extrusion dimension.		

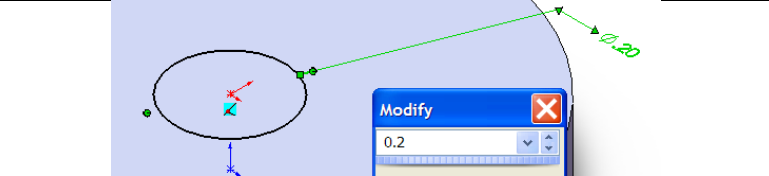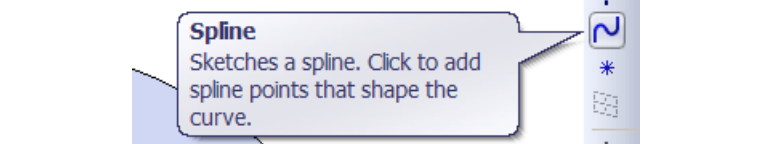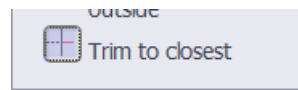|	
7. Click on Extrude Boss / Base, and select the bottom of the disk.	Extrude1
8. Draw a 0.2 inch diameter circle on the bottom of the disk, and protrude it outward from the disk to a distance of 0.03 inches.	Ø.20
9. Click on Extrude Boss / Base, and begin to draw the 2D features that will define the impeller blades. Select the top face of the disk for drawing.	
10. Draw a 0.2 inch diameter circle centered on the origin.	Ø.20 Modify 0.2
11. Select the Spline tool on the Sketch toolbar and proceed to draw the profiles of an impeller blade.	Spline Sketches a spline. Click to add spline points that shape the curve.
12. Draw arcs to define an impeller blade. Note that the dimensions are not critical. But, don't make the blades too narrow as they will easily break off during pump assembly (the one shown is almost too thin).	Ø.20
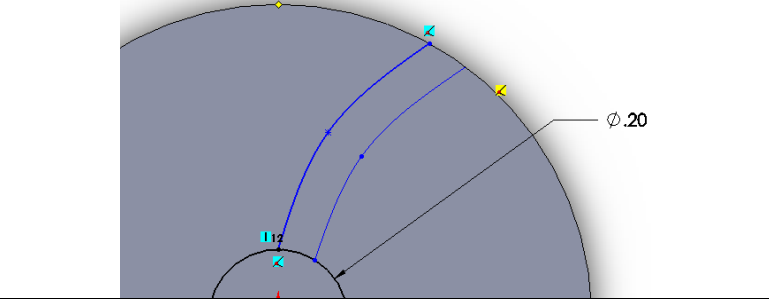
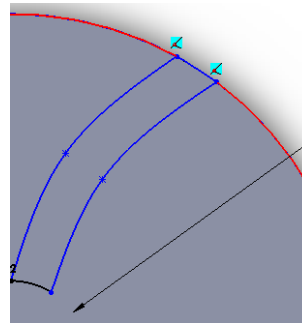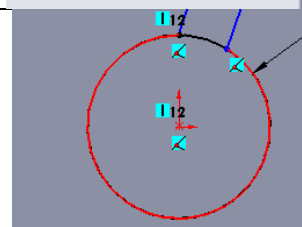|	
13. Draw an additional circle that coincides with the outer boundary of the disk (0.9 inches in diameter). This circle will be used to define the outer edge of the impeller blade.	
14. Select the Trim Entities tool from the Sketch toolbar to eliminate the portions of the inner and outer circles that are not part of the impeller blade. Select the "Trim to closest" option for trimming.	
15. Eliminate the red portion of the inner circle (it will turn red when you your pointer is in the right place). Repeat this for the outer circle. Click the green checkmark to end the trimming process.	
16. You should now have the 2D profile of a single impeller blade. Be sure to save your work as you go along.	
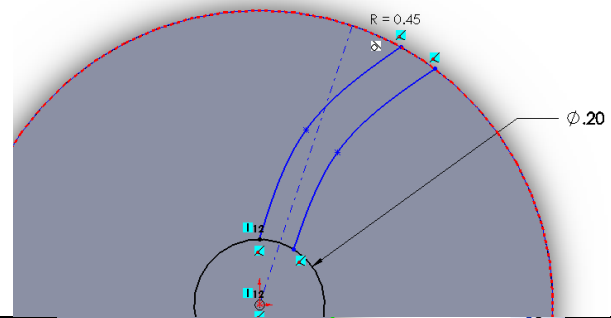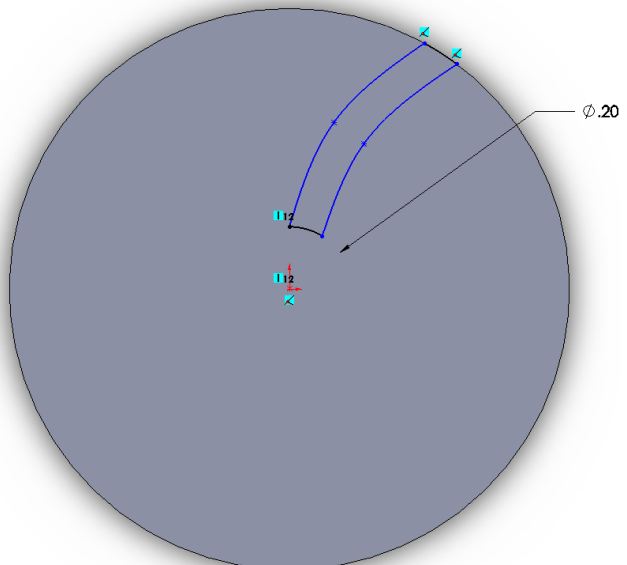
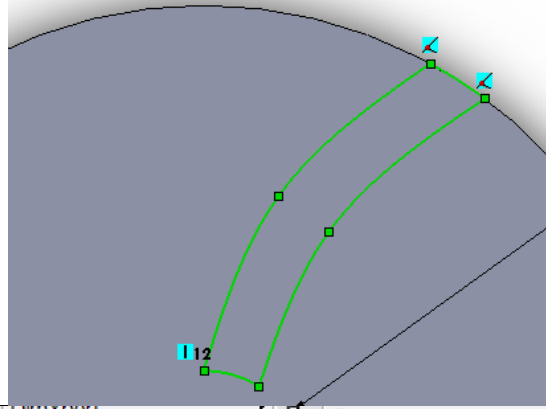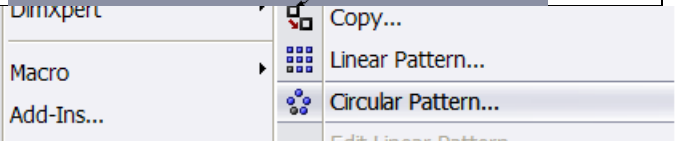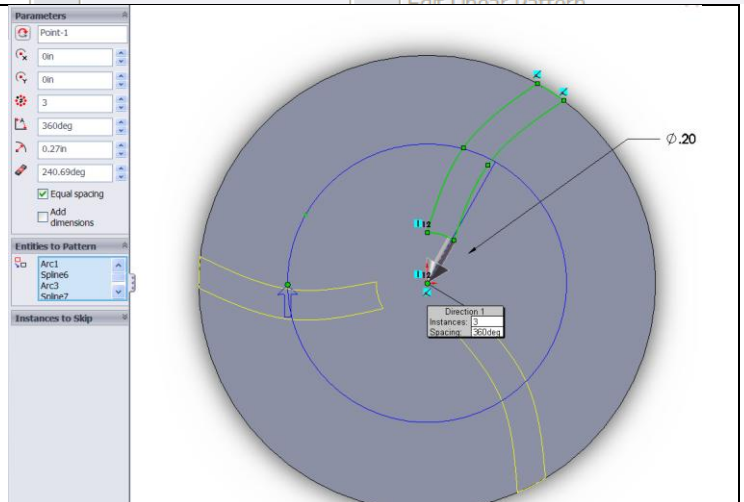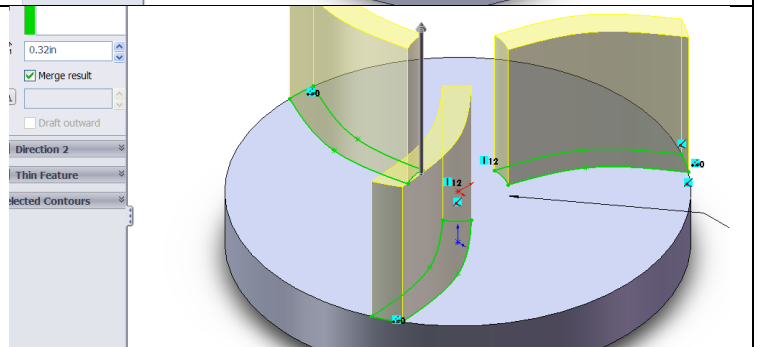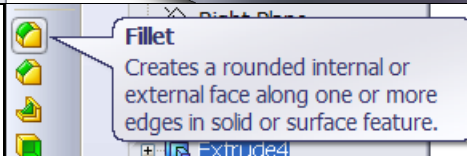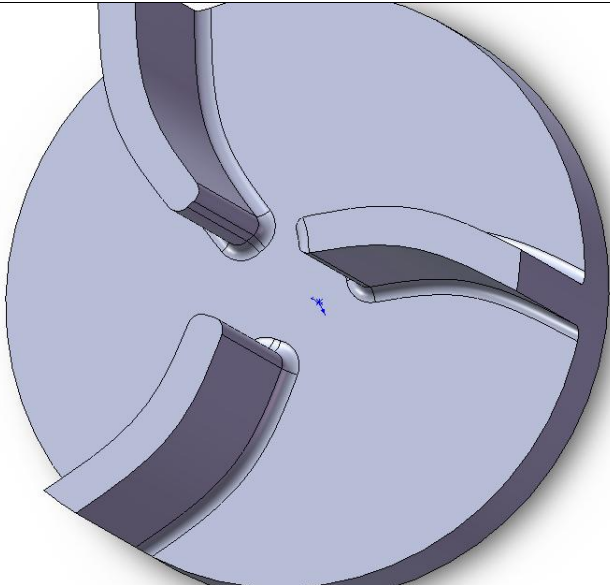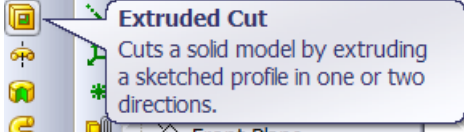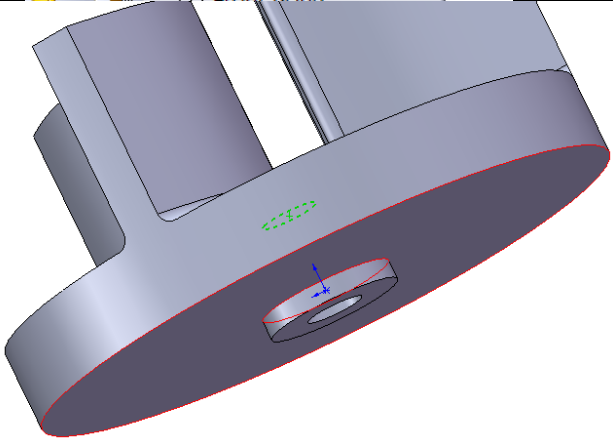|	
17. Hold the <Ctrl> button while you click around the boundary of the blade profile. The lines will turn green as they are selected.	
18. Select Circular Pattern from . . . Tools > Sketch Tools	DimXpert Copy... Macro Linear Pattern... Add-Ins... Circular Pattern...
19. Select 3 for the number of instances of the impeller blade (you can have more than 3 blades if you like). Since you defined the initial disk centered about the origin, SolidWorks automatically selects the center point as the axis about which coping occurs. Click the green check mark when you are done.	
20. Return and extrude the blades outward 0.32 inches. This should leave 0.03 inch of gap between the impeller and the face plate of the pump.	
21. Select the Fillet tool from the features toolbar.	Fillet Creates a rounded internal or external face along one or more edges in solid or surface feature.

22. Round the edges shown to the largest radius possible. If you get an error, it is likely that you are using a radius that is too large. Adding this radius will make the blades stronger.	
23. Select Extruded Cut from the features toolbar.	
24. Cut out a 0.086 inch hole through the center of the part.	

25. Save your file as a part file (SLDPRT) and as a STL file (.stl) using the following naming convention:
    a. first initial, underscore, last name .SLDPRT example: **j_doe.SLDPRT**
    b. first initial, underscore, last name .STL example: **j_doe.STL**

To save the .STL file, you will need to go to **File > Save As > Save as type:** and choose "**STL (*.stl)**. Then click on **Options**, and enter **0.001 in** for the "Deviation" tolerance and **2.000deg** for the "Angle" tolerance. This will ensure that your STL file produces a "smooth" part when it prints. Print out a picture of your impeller and turn it in with your homework.
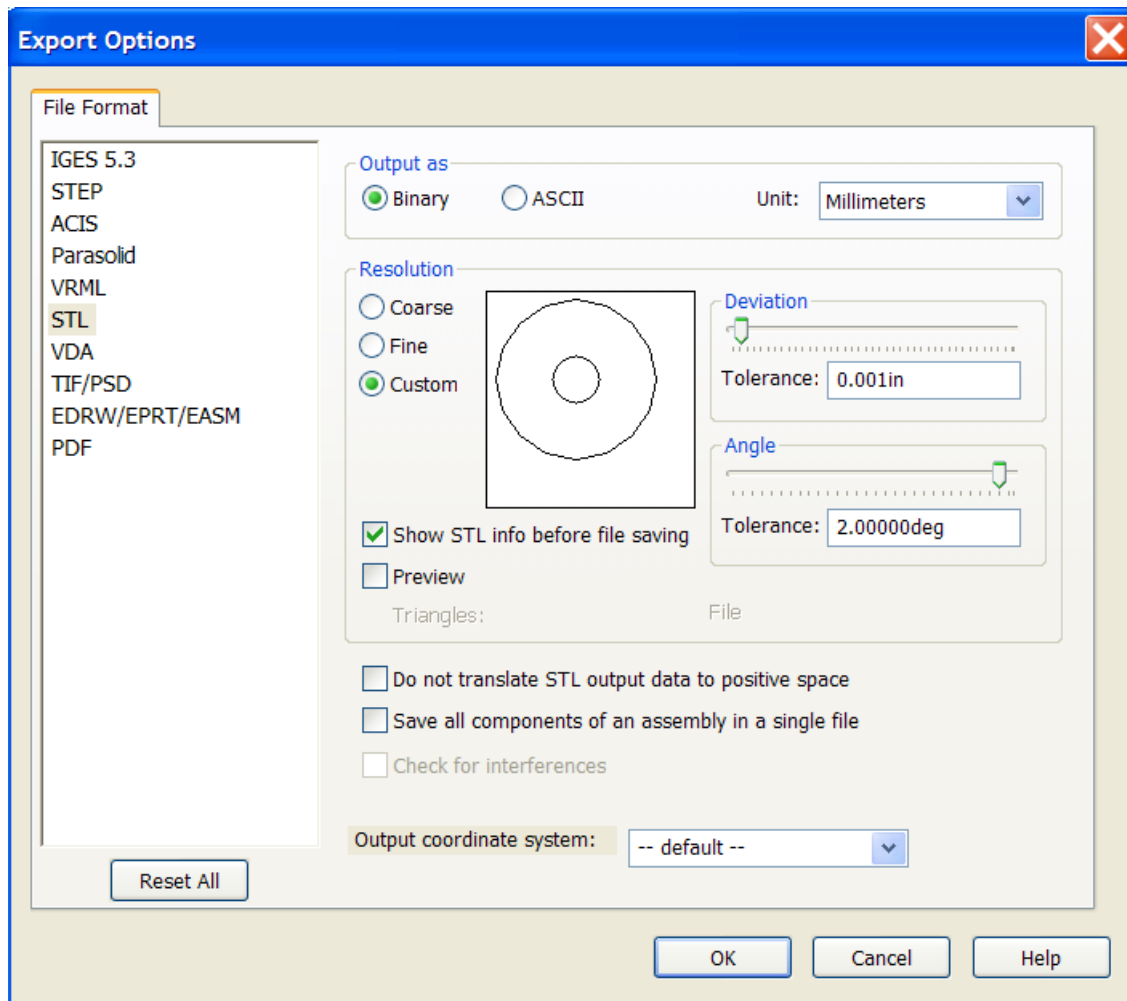
Get together with your partner, and select one of your impellers to have printed of ABS plastic on a rapid prototyping machine. Email your SLDPRT and STL files to your instructor for printing.

Note: Be sure to exit SolidWorks before sending your file. The instructors have had trouble in the past reading SolidWorks files; we believe that sending a file that has not been properly closed may render it unreadable.