6-9)

a)

F = Cy^2***j***. Any displacement in the x or z directions will result in no work. Any displacement in the y direction (from a given y_i to a given y_f) will result in the same amount of work. **F is conservative.**

b)

F = Cy^2***i***. Any displacement in the y or z directions will result in no work. Any displacement in the x direction (from a given x_i to a given x_f) could result in different amounts of work, depending on the value of y. **F is non-conservative.**

There is a short and easy way to tell if a field is conservative: take the *curl* of the field. If curl **F** = 0, then **F** is conservative.

Now, curl **F** =

$$\begin{matrix} \boldsymbol{i} & \boldsymbol{j} & \boldsymbol{k} \\ d/dx & d/dy & d/dz \\ F_x & F_y & F_z \end{matrix}$$

= $(dF_z/dy - dF_y/dz)\,\boldsymbol{i} + (dF_x/dz - dF_z/dx)\,\boldsymbol{j} + (dF_y/dx - dF_x/dy)\boldsymbol{k}$ =

For a) curl **F** = (0 - 0) ***i*** + (0 - 0) ***j*** + (0 - 0)***k*** = 0, so **F** is conservative.

For b) curl **F** = (0 - 0) ***i*** + (0 - 0) ***j*** + (0 - 2Cy)***k*** <> 0, so **F** is not conservative.