**The exam is closed book and closed notes.**

The velocity potential for a cylinder with radius *a* rotating in a uniform stream of ideal fluid with velocity *U* is:

where Γ is the circulation. (a) Find the tangential velocity at the surface of the cylinder (r=a). (b) For what value of the circulation (as a function of *a* and *U*) will the stagnation point be located at point B on the cylinder?

Note:



**Solution:**

(a)

**(+3)**

At the cylinder surface (r=a):

**(+2)**

(b)

For stagnation point:

**(+2)**

At point B:

Therefore:

**(+3)**