|  |  |  |  |
| --- | --- | --- | --- |
| **FORMULA:** | **RECTANGULAR** | **PARAMETRIC** | **POLAR** |
| **DERIVATIVE** | (slope of curve, velocity of a particle, etc.) |  | Convert to parametric.  x = rcosθ  y = rsinθ |
| **2ND DERIVATIVE** |  |  | Convert to parametric. |
| **AREA** |  | Note: ***a*** and ***b*** are limits for ***x***. Convert to  and . |  |
| **VOLUME** | Disc:  Washer: | Note: ***a*** and ***b*** are limits for ***x***. Convert to  and . | Convert to parametric. |
| **ARC LENGTH** |  |  |  |
| **SPEED** |  |  |  |
| **TOTAL DISTANCE** |  | Arc length! | Arc length! |
| **POSITION** |  | , where    and | Convert to parametric. |

***COMPARISON OF FORMULAS FOR RECTANGULAR, PARAMETRIC, & POLAR EQUATIONS***

***Other things to remember:***

* + Speed is increasing when the signs of velocity and acceleration are the same.
  + If particle moves along a horizontal line (x-axis), it's moving left when  and right when .
  + A particle is at rest when v(t) = 0 and a(t) = 0 for the same value of t.
  + For parametrically defined curves, the velocity vector is  and the acceleration vector is .