1. A particle moves on a curve \( x = t + \cos t \), \( y = 2t - \sin t \). (a) Find the particle's velocity at \( t = \frac{\pi}{2} \).
(b) Find the tangent to the curve at \( t = 0 \).
(c) Sketch the curve roughly. (d) Find the area of the region under the curve for \( 0 \leq t \leq \pi/2 \).
(e) Rotate this region around the y-axis. Set up the integral for the volume of the resulting solid.
(f) Set up the integral for the arc length of this curve for \( 0 \leq t \leq \pi/2 \).

2. Consider the equation \( r = 1 + 2 \sin \theta \) in polar coordinates. Restrict yourself to \( \theta \) for which \( 1 + 2 \sin \theta \geq 0 \).
(a) Sketch the graph of the resulting curve.
(b) Compute the pt. on this curve with maximal distance from the origin.
(c) Compute the pt. on this curve with maximal distance from the y-axis.
(d) Compute the area enclosed by the curve.
(e) Find the area of the intersection between the region enclosed by the curve and the region inside the circle \( r = 3/2 \).
(f) Set up the integral for the arc length of this curve.