1.) Graph the curve represented by the following pairs of parametric equations. If possible, eliminate \( t \) and write an equation for the curve in rectangular coordinates.

a.) \( x = t - 1, \ y = t + 1 \)

b.) \( x = t, \ y = t^2 \)

c.) \( x = t^2, \ y = t^4 \)

d.) \( x = e^t, \ y = e^{2t} \)

e.) \( x = \cos t, \ y = \sin t \)

f.) \( x = 3 \cos t, \ y = \sin t \)

g.) \( x = t^2 - t, \ y = t^2 \)

h.) \( x = \ln t, \ y = t + 1/t \)

2.) Determine the slope of the line tangent to the following graphs at the indicated value.

a.) \( y = (\pi - \arctan x)^4 \) at \( x = 1 \)

b.) \( x = t^2 + 1, \ y = e^{-t} + t \) at \( t = 1 \)

c.) \( r = 3 + \sin \theta \) at \( \theta = \pi/4 \)

3.) Compute \( \frac{dy}{dx} \) and \( \frac{d^2 y}{dx^2} \) for each of the following.

a.) \( y = \frac{x}{x^2 + 1} \)

b.) \( x = t + \sin t, \ y = e^{\tan t} - t \)

c.) \( r = \theta \)

d.) \( r = \sin \theta \)

4.) Consider the curve given parametrically by

\[ x = t^2 + e^t \] and \( y = t + e^t \) for \( t \) in \([0, 1]\).

Find the area of the region lying under the curve and above the x-axis for \( x \) in \([1, 1 + e]\).
5.) Compute the arc lengths of the given curves over the indicated intervals.
   
   a.) \( y = x^{5/4} \) for \( x \) in \([0, 1]\)
   
   b.) \( y = \frac{1}{(2x^2)} + \frac{x^4}{16} \) for \( x \) in \([2, 3]\)
   
   c.) \( x = \cos t + t \sin t \) and \( y = \sin t - t \cos t \) for \( t \) in \([\pi/6, \pi/4]\)
   
   d.) \( r = \sin^2 (\theta/2) \) for \( \theta \) in \([0, \pi]\)

6.) Consider a particle moving along the curve given parametrically by

   \( x = t + \cos t \) and \( y = t - \sin t \) for \( t \geq 0 \).

   a.) Determine a formula for the speed (ft./sec.) of the particle at time \( t \).
   
   b.) What is the speed when \( t = 0 \) sec. ? \( t = \pi/2 \) sec. ? \( t = 100 \) sec. ?

7.) Compute the curvature of the given curve at the given point.

   a.) \( y = x^3 \) at \((-1, 1)\)
   
   b.) \( y = e^{x^2} \) at \((1, e)\)
   
   c.) \( x = t^2 - t, y = t^2 + t \) at \( t = 1 \)