## SECTION 7.2: CALCULUS OF PARAMETRIC CURVES

(1) Suppose you are given a curve defined as $x(t)$ and $y(t)$:

(a) $\frac{dy}{dx}$

(b) $\frac{d^2y}{dx^2}$

(2) Given the parametric equations $x(t) = t^3 + 1,\ y(t) = 2t - t^2$

(a) Find $dy/dx$ and determine its value at $t = -1, 0$, and $1$.

(b) Write the equation of the tangent line to the curve at $t = 1$.

(c) Find $d^2y/dx^2$.

(d) Is the curve concave up or concave down at $t = 1$?

(e) Use technology to graph the curve and see if your answers above are plausible.

(3) Suppose you are given a curve defined as $x(t)$ and $y(t)$ the area under curve can be calculated as:

(4) Given the parametric equations $x(t) = t^3 + 1,\ y(t) = 2t - t^2$, determine the interval of $t$-values for which the curve above the $x$-axis. For this interval, find the area below the curve and above the $x$-axis.

(5) Suppose you are given a curve defined as $x(t)$ and $y(t)$ the arc length of curve can be calculated as

(6) Determine the arc length of the cycloid $x(\theta) = \theta - \sin(\theta)$ and $y(\theta) = 1 - \cos(\theta)$ from $t = 0$ to $t = 2\pi$.