5. [12 points] A particle moves according to the following parametric equations
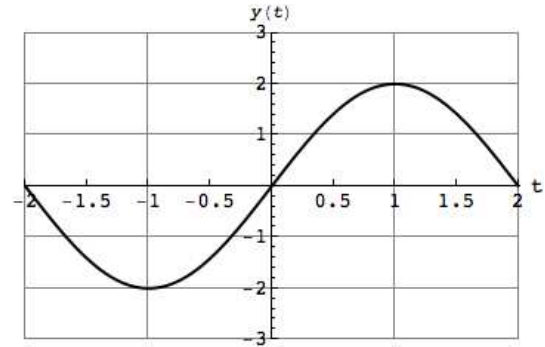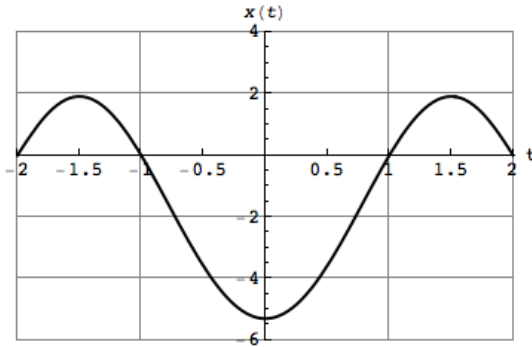
$$x = x(t) \quad \text{and} \quad y = y(t) \quad \text{for} \quad -2 \le t \le 2,$$

where the graphs of $x(t)$ and $y(t)$ are shown below.

a. [2 points] Is there a value of t at which the particle is at the point $(0, 2)$? If so, find the value of t where this happens.

> *Solution:* $t = 1$.

b. [3 points] At which value(s) of t is the particle on the x-axis?

> *Solution:* $t = -2, 0, 2$.

c. [4 points] At what points (x, y) does the curve traveled by the particle have a horizontal tangent line? Include the times for each point.

> *Solution:* $y'(t) = 0$ when $t = 1$, $(x, y) = (0, 2)$ and $t = -1$, $(x, y) = (0, -2)$.

d. [3 points] For which of values of t is the slope of the tangent line to the curve positive?

> *Solution:*   Slope$=\frac{y'(t)}{x'(t)} > 0$ if x' and y' have the same sign. This occurs at $(0, 1)$, $(-1.5, -1)$ and $(1.5, 2)$.