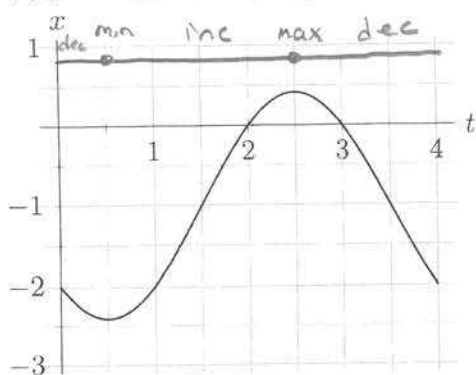
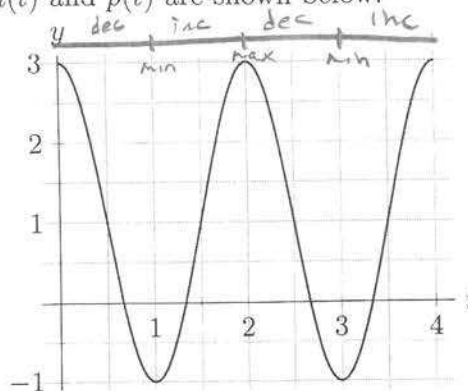


2. [9 points] A particle travels along the path given by the parametric equations $x = h(t)$ and $y = p(t)$ for $0 \leq t \leq 4$. Graphs of the functions $h(t)$ and $p(t)$ are shown below.



Graph of $x = h(t)$



Graph of $y = p(t)$

Note: The local minima and maxima of the functions h and p are as they appear in the graphs. In particular, they occur at integer or half-integer values of t .

a. [2 points] In what interval(s) is the particle moving to the left and upwards?
Circle ALL intervals below during which the particle is always moving to the left and upwards. (Circle NONE OF THESE if appropriate.)

Left: h dec
(0, 1/2), (2.5, 4)

$0 < t < 0.5$ $0.5 < t < 1$ $1 < t < 1.5$ $1.5 < t < 2$ $2 < t < 2.5$

up: p inc
(1, 2), (3, 4)

$2.5 < t < 3$ $3 < t < 3.5$ $3.5 < t < 4$ NONE OF THESE

b. [2 points] Find the equations of all horizontal tangent lines to the path of this particle for $0 < t < 4$. Write NONE if there are no horizontal tangent lines.

horizontal $\Rightarrow 0 = \frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{p'(t)}{h'(t)} \Rightarrow p'(t) = 0$.

So horizontal tangents at $t = 1, 2, 3$
where $y = -1, 3, -1$.

Answer: $y = -1, y = 3$

c. [5 points] On the axes below, sketch a graph of the path along which the particle moves between time $t = 0$ and $t = 4$.

On your sketch, label the points described below with the corresponding value(s) of t .

- The particle's position at times $t = 0, 0.5, 1, 1.5, 2, 2.5, 3, 3.5$, and 4 .
- The points at which the particle is highest, lowest, farthest right, and farthest left.

