## 2024 BC #2
## (calculator active)

(a)

speed of the particle, $s(t) = \sqrt{\left(x'(t)\right)^2 + \left(y'(t)\right)^2}$

speed of the particle at time $t = 2$, $s(2) = \sqrt{\left(x'(2)\right)^2 + \left(y'(2)\right)^2} = \boxed{12.3048 \frac{\text{cm}}{\text{sec}}}$ or 12.304 or 12.305

(b)

total distance $= \int_0^2 s(t)\,dt = \boxed{15.9017 \text{ cm}}$ or 15.901 or 15.902

(c)

position of the particle $= y(2) + \int_2^t y'(x)\,dx$

position of the particle at $t = 0$ is $y(0) = y(2) + \int_2^0 y'(x)\,dx = \boxed{-1.1736 \text{ cm}}$ or $-1.173$ or -1.174

(d)

Since on $2 \le t \le 8$ the particle is in the first quadrant, then $y(t) > 0$ there.

So the particle is moving towards the $x-$axis and $y'(t) < 0$.

Graphing $y'(t)$ from $2 \le t \le 8$, $y(t) > 0$ and $y'(t) < 0$ when $\boxed{5.221833 < t < 8}$