2021 Radian Mode

a) $\text{Speed} = \|v(t)\| = \|r'(t)\| = \sqrt{\left[\frac{dx}{dt}\right]^2 + \left[\frac{dy}{dt}\right]^2}$

$S = \sqrt{[x'(1.2)]^2 + [y'(1.2)]^2} \approx 1.271488$ +1

$\text{Acceleration} = a(t) = r''(t) = \langle x''(1.2), y''(1.2) \rangle$

$\doteq \langle 6.246630, 0.405125 \rangle$

with supporting notation +1 or $6.2466\,\vec{i} + 0.4051\,\vec{j}$

b) $L \overset{+1}{=} \int_0^{1.2} \sqrt{[x'(t)]^2 + [y'(t)]^2}\, dt$ ← don't forget

≈ 1.009817 +1

c) $\frac{dx}{dt} = (t-1)e^{t^2} = 0 \Rightarrow t = 1$
+1

$x'(t)$	$-$		$+$
$t=0$	moving left	1	moving right

$x(1) = -2 + \int_0^1 x'(t)\,dt \approx -2.603511$

$y(1) = 5 + \int_0^1 y'(t)\,dt \approx 5.410486$

Farthest to the left at $t=1$ @ $(-2.6035, 5.4104)$
+1 +1 +1

+1 $x'(t) > 0$ for all $t > 1$ $\therefore$ the particle continues to move to the right and there is no point the particle is farthest right for $t \geq 0$

2016 #2 BC

+1 uses initial condition

a) $x(3) = x(0) + \int_0^3 x'(t)\,dt$ +1

$= 5 + 9.377035$

$= 14.377$ } +1

$y(3) = -\frac{1}{2}$

b) $\frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \left.\frac{\frac{1}{2}}{t^2+\sin(3t^2)}\right|_{t=3} = 0.05$

+1 w/ supporting work

c) Speed $= \sqrt{(x'(3))^2 + (y'(3))^2}$ +1

$= 9.969$ or 9.968 +1

d) Distance $= \int_0^2 \sqrt{(x'(t))^2 + (y'(t))^2}\,dt$ +1

+1 $= \int_0^1 \sqrt{(x'(t))^2 + (-2)^2}\,dt + \int_1^2 \sqrt{(x'(t))^2 + (0)^2}\,dt$

$= 4.350$ or 4.349 +1

2015 #2 BC

a) $x(2) = 3 + \int_1^2 v(t)\,dt = 2.557$ or 2.556

+1 +1 +1

b) $\frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{e^{0.5t}}{\cos(t^2)} = 2$ $\quad t = 0.840$

+1 +1

c) $\text{Speed} = \sqrt{\cos^2(t^2) + e^t}$ +1

$\sqrt{\cos^2(t^2) + e^t} = 3$

$t = 2.196$ or 2.195 +1

d) $\text{Distance} = \int_0^1 \sqrt{\cos^2(t^2) + e^t}\,dt$ +1

$= 1.595$ or 1.594 +1

2012 #2 BC

a) $\left.\frac{dx}{dt}\right|_{t=2} = \frac{2}{e^2} > 0$

The particles horizontal movement is to the right becaues $x'(2) > 0$ +1

$\frac{dy}{dx} = \left.\frac{dy/dt}{dx/dt}\right|_{t=2} = 3.055$ or 3.054

+1

+1

b) $x(4) = 1 + \int_2^4 x'(t)\,dt$ +1

$= 1.253$ or 1.252 +1

c) Speed $= \sqrt{(x'(4))^2 + (y'(4))^2} = 0.575$ or 0.574 +1

Acceleration $= \langle x''(4), y''(4) \rangle$

$= \langle -0.041, 0.989 \rangle$ +1

d) Distance $= \int_2^4 \sqrt{(x'(t))^2 + (y'(t))^2}\,dt$ +1

$= 0.651$ or $.650$ +1

2011 #1 BC

a) Speed $= \sqrt{(x'(3))^2 + (y'(3))^2}$

$= 13.006$ or 13.007 +1

Acceleration $= \langle x''(3), y''(3) \rangle$

$= \langle 4, -5.466 \rangle$ or $\langle 4, -5.467 \rangle$ +1

b) $\dfrac{dy}{dx} = \left.\dfrac{dy/dt}{dx/dt}\right|_{t=3}$ or $\dfrac{y'(3)}{x'(3)} = 0.031$ +1

c) $x(3) = 0 + \underbrace{\int_0^3 x'(t)\,dt}_{+1} = \underbrace{21}_{+1}$

$y(3) = -4 + \underbrace{\int_0^3 y'(t)\,dt}_{+1} = -3.226$ +1

d) Distance $= \underbrace{\int_0^3 \sqrt{x'(t)^2 + y'(t)^2}\,dt}_{+1} = 21.091$ +1