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Multivariable Calculus 1: Vectors and Derivatives

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4. Parametric curves continued

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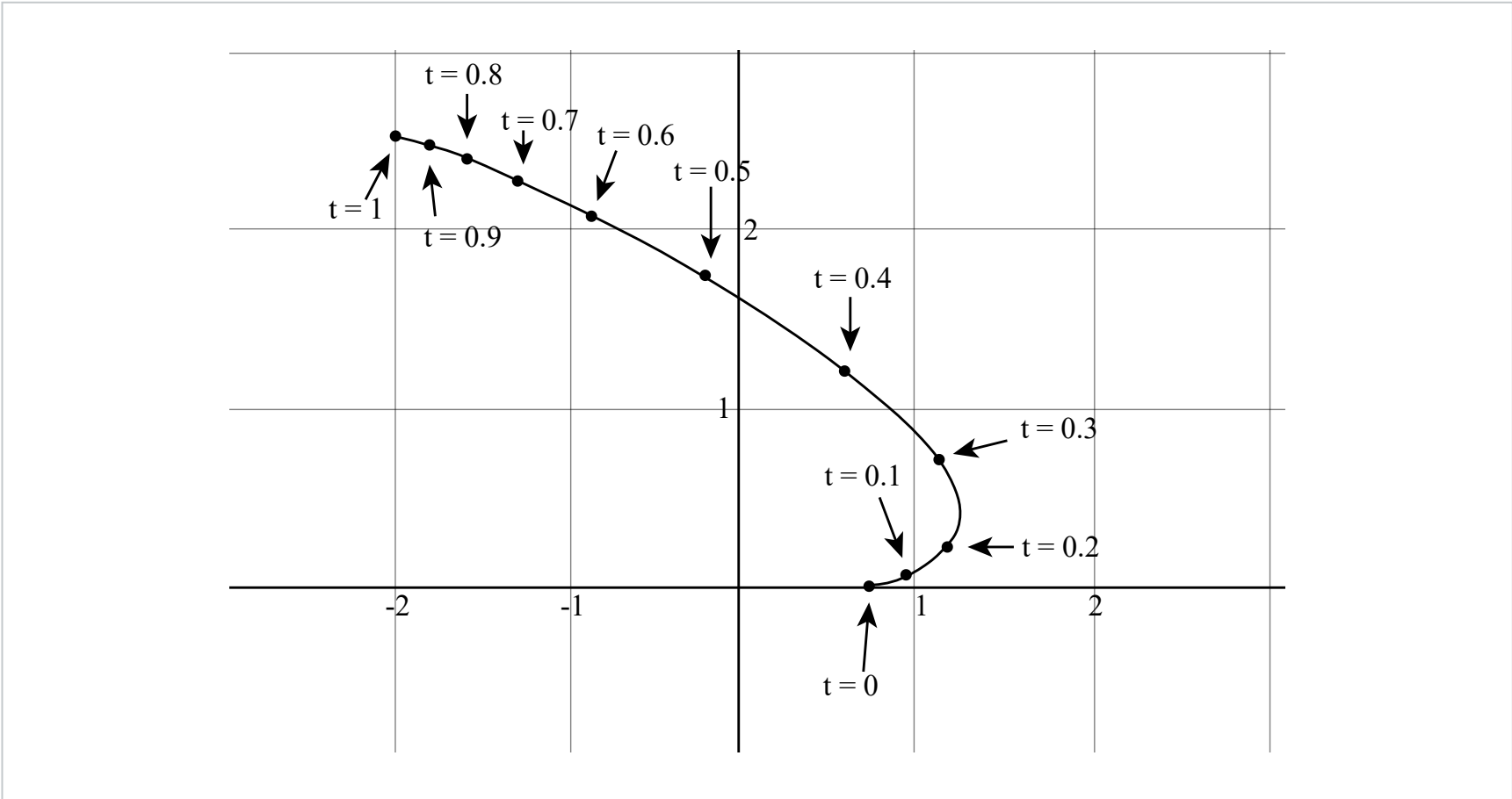Part A due Oct 5, 2021 20:30 IST

Practice

5A-7(a)

2/2 points (graded)
The following picture shows a parametrized curve $(x\,(t)\,,y\,(t))$ as t goes from 0 to 1.

The following question asks you to compare the values of the function $\sqrt{(x\,(t))^2 + (y\,(t))^2}$ at the times $t = 0.5$ and $t = 1$.

Which is bigger?

- ○ $\sqrt{x(0.5)^2 + y(0.5)^2}$

- ● $\sqrt{x(1)^2 + y(1)^2}$

✔

The following question asks you to compare the values of the function $\sqrt{(x'\,(t))^2 + (y'\,(t))^2}$ at the times $t = 0.5$ and $t = 1$.

Which speed is bigger?

- ● $\sqrt{x'(0.5)^2 + y'(0.5)^2}$

- ○ $\sqrt{x'(1)^2 + y'(1)^2}$

✔

Solution:

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We are comparing the distance from the origin on the parametrized curve at $t = .5$ vs $t = 1$. Evidently:

$$\sqrt{x(1)^2 + y(1)^2} > \sqrt{x(0.5)^2 + y(0.5)^2}.$$

We are comparing the speed of the parametrized curve at $t = 0.5$ vs $t = 1$. The curve covers larger distances faster at $t = .5$: $\sqrt{x'(0.5)^2 + y(0.5)^2} > \sqrt{x'(1)^2 + y'(1)^2}$.
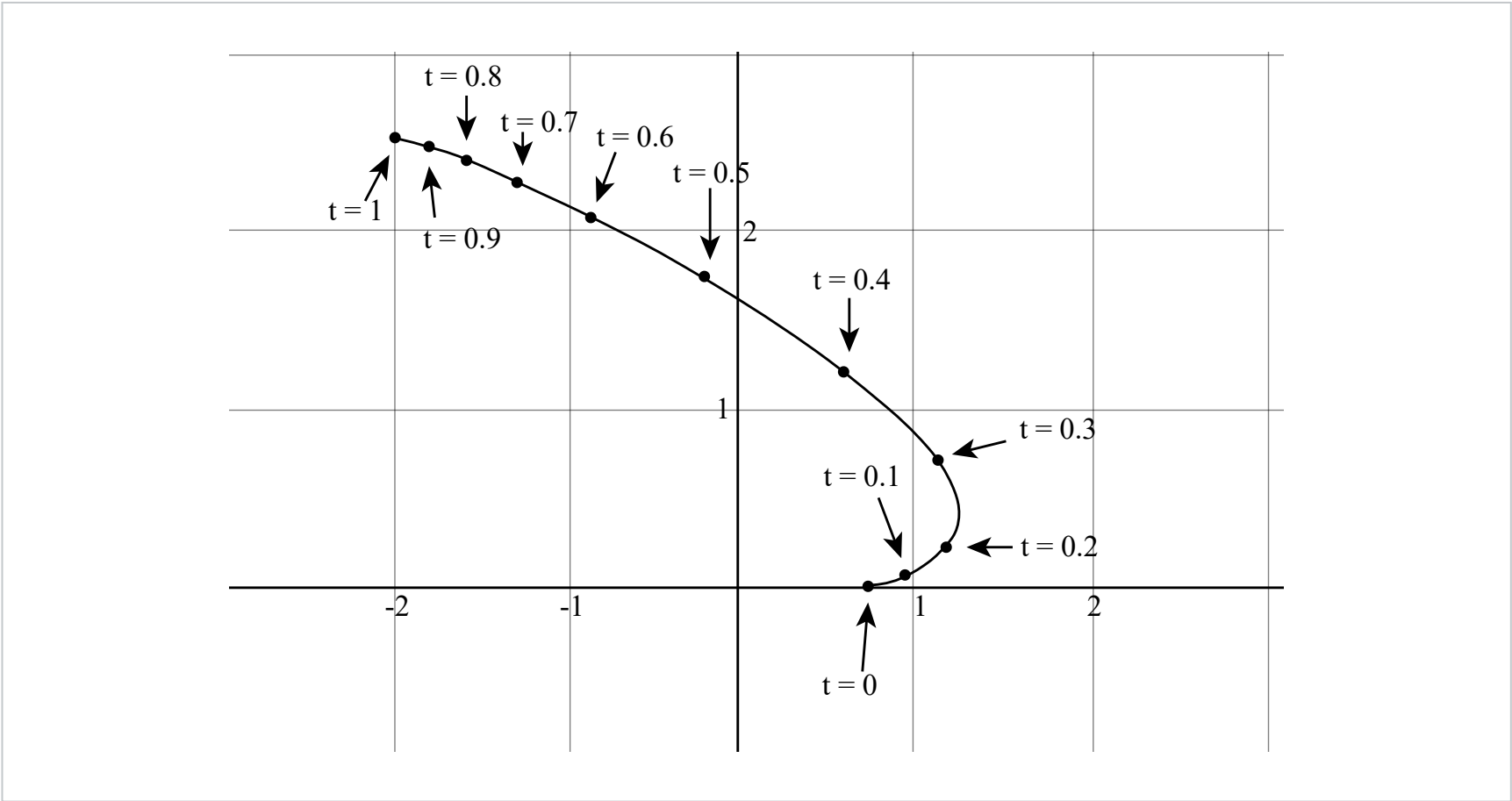
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ℹ Answers are displayed within the problem

5A-7(b)

2/2 points (graded)

The following picture shows a parametrized curve $(x(t), y(t))$ as t goes from 0 to 1.

Which is the best approximate value of $\sqrt{x(1)^2 + y(1)^2}$?

- ◯ 0.1

- ◯ 0.3

- ◯ 1

- ⦿ 3

- ◯ 10

✔

What is the best approximate value of $\sqrt{x'(0.5)^2 + y'(0.5)^2}$?

- ◯ 0.1

- ◯ 0.3

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○ 1

○ 3

◉ 7

✔

Solution:

The coordinates are $\approx (-2, 2.5)$, so the distance from the origin is $\approx$ $\boxed{3}$.

The curve traces out a segment of length ≈ 0.8 between $t = 0.4$ and $t = 0.5$ ($\Delta t = 0.1$), so one approximation for the speed is $\approx$ $\boxed{8}$. The curve traces out a segment of length ≈ 0.6 between $t = 0.5$ and $t = 0.6$ ($\Delta t = 0.1$), so a second approximation for the speed is $\approx$ $\boxed{6}$. Therefore the best choice of the options given is 7.

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ℹ   Answers are displayed within the problem

4. Parametric curves continued

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