Math 32 – Workshop #11

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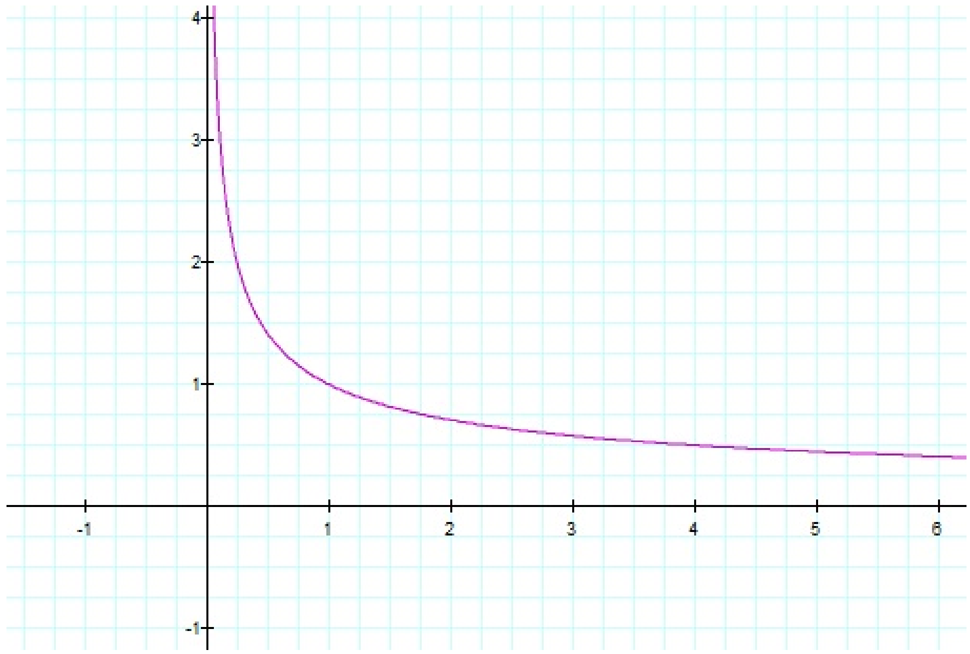
1. Find the length of the curve $\vec{\mathbf{r}}(t) = \langle 2e^t, e^{-t}, 2t\rangle$, $0 \le t \le 1$.

2. (a) Find the velocity, acceleration, and speed of the a particle with the position function $\vec{\mathbf{r}}(t) = \langle e^{2t}, e^{-t}\rangle$.

   (b) A portion of the graph of $\vec{r}(t) = \langle e^{2t}, e^{-t}\rangle$ is given below. Carefully sketch the position, velocity, and acceleration vectors at $t = 0$.



3. Find the velocity and position vectors of a particle that has the given acceleration and the specified initial velocity and position.

   (a) $\vec{\mathbf{a}}(t) = \vec{\mathbf{i}} - \vec{\mathbf{j}} + 3\vec{\mathbf{k}}$, $\vec{v}(0) = 10\vec{\mathbf{j}}$, $\vec{j}(0) = \vec{\mathbf{0}}$.

   (b) $\vec{\mathbf{a}}(t) = 9\Big(\sin(3t)\vec{\mathbf{i}} + \cos(3t)\vec{\mathbf{j}}\Big) + 4\vec{\mathbf{k}}$, $\vec{\mathbf{v}}(0) = 2\vec{\mathbf{i}} - 7\vec{\mathbf{k}}$, $\vec{\mathbf{r}}(0) = 3\vec{\mathbf{i}} + 4\vec{\mathbf{j}}$.

4. Sketch the following regions in $\mathbb{R}^2$.

   (a) $R = \Big\{(x, y)\,\Big|\, x^2 + y^2 \le 9, \text{ and } y \ge -1\Big\}$.

   (b) $R = \Big\{(x, y)\,\Big|\, x > 0, \text{ and } x - y > 1\Big\}$.